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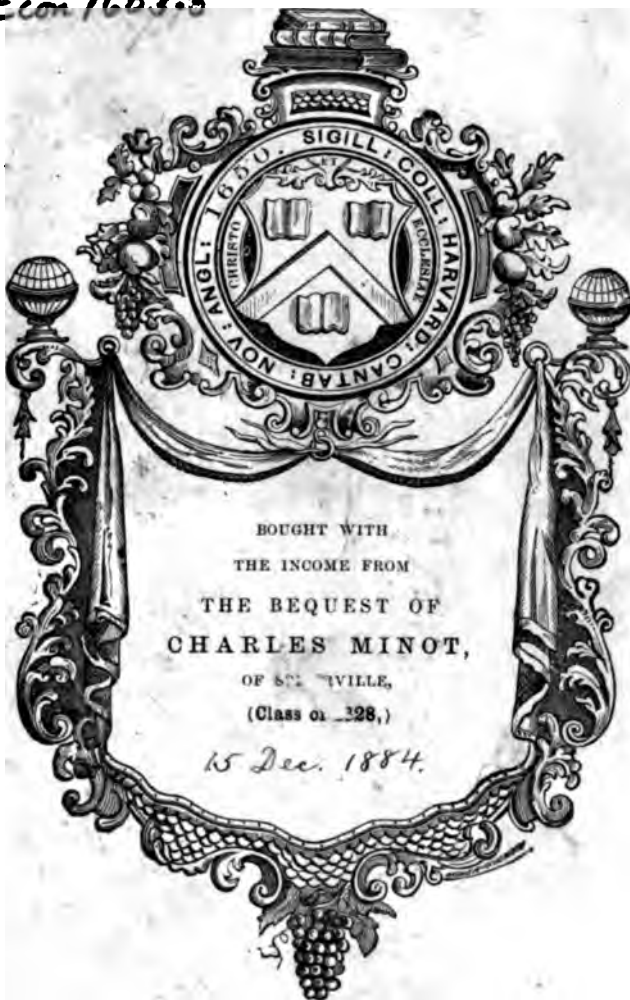
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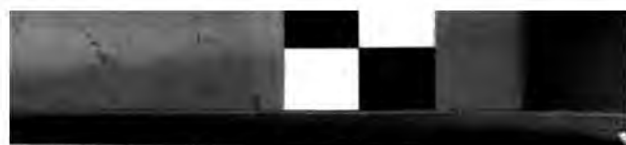
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International Fisheries Exhibition

LONDON, 1883

THE

FISHERIES EXHIBITION
LITERATURE.

VOLUME IV.

CONFERENCES—PART I.

INAUGURAL ADDRESS BY PROFESSOR HUXLEY, P.R.S.

NOTES ON THE SEA FISHERIES AND FISHING POPULATION OF THE
UNITED KINGDOM.

PRINCIPLES OF FISHERY LEGISLATION.

FISH TRANSPORT AND FISH MARKETS.

THE ECONOMIC CONDITION OF FISHERMEN.

A NATIONAL FISHERIES SOCIETY.

RIVER POLLUTION BY REFUSE FROM MANUFACTORIES
AND MINES.

PRACTICAL FISHERMEN'S CONGRESS.

THE SCIENTIFIC RESULTS OF THE EXHIBITION.

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INAUGURAL MEETING OF THE FISHERY CONFERENCES.

ADDRESS

BY

PROFESSOR HUXLEY, P.R.S.,

DELIVERED MONDAY, JUNE 18, 1883,

H.R.H. THE PRINCE OF WALES, K.G.,

PRESIDENT OF HER MAJESTY'S COMMISSIONERS,

IN THE CHAIR.

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INAUGURAL MEETING,

MONDAY, JUNE 18, 1883.

H.R.H. THE PRINCE OF WALES.

YOUR Excellencies, my Lords and Gentlemen,—Before calling upon Professor Huxley to deliver his inaugural address to you, I am anxious to welcome all those gentlemen of the International Jury on coming here to-day at the opening of our Congress. The Fisheries Exhibition, up to the present moment, I think, may be considered to have been a success. The number of people who have visited it evince the interest taken in this great and national undertaking, as I believe I am not wrong in stating that not far short of half-a-million have already seen it. But to-day, when the duties of the jurors are about to commence, we may look upon the scientific and more important part of the Fisheries Exhibition as about to commence ; and I beg to thank all those gentlemen who have come forward, not only from our own country, but from different parts of the world, to give us their assistance ; and I feel sure that their labours will be crowned with success. I will now call upon Professor Huxley to deliver his inaugural address.

PROFESSOR HUXLEY.

Your Royal Highness, your Excellencies, my Lords and Gentlemen,—It is doubtful whether any branch of industry can lay claim to greater antiquity than that of Fishery. Its

been driven to invent their alphabet by the inconvenience of ideographic writing for the keeping of the books and the conduct of the correspondence of the great commerce which had grown out of Fishery.

These few remarks must suffice to indicate the wide field of interesting research which fisheries offer to the philosophical historian ; and I pass on to speak of the fisheries from the point of view of our present practical interests.

The supply of food is, in the long run, the chief of these interests. Every nation has its anxiety on this score, but the question presses most heavily on those who, like ourselves, are constantly and rapidly adding to the population of a limited area, and who require more food than that area can possibly supply. Under these circumstances, it is satisfactory to reflect that the sea which shuts us in, at the same time opens up to us supplies of food of almost unlimited extent.

The produce of the sea around our coasts bears a far higher proportion to that of the land than is generally imagined. The most frequented fishing grounds are much more prolific of food than the same extent of the richest land. Once in a year, an acre of good land, carefully tilled, produces a ton of corn, or two or three hundredweight of meat or cheese. The same area at the bottom of the sea in the best fishing grounds yields a greater weight of food to the persevering fisherman every week in the year. Five vessels belonging to the same source in a single night's fishing brought in 17 tons weight of fish—an amount of wholesome food equal in weight to that of 50 cattle or 300 sheep. The ground which these vessels covered during the night's fishing could not have exceeded an area of 50 acres.

My colleagues * and I made this statement a good many years ago. I have recently tried to discover what yield may be expected, not from the best natural fishing grounds, but from piscicultural operations. At Comacchio, close to the embouchure of the Po into the Adriatic, there is a great shallow lagoon, which covers some 70,000 acres, and in which pisciculture has been practised in a very ingenious manner for many centuries. The fish cultivated are eels, grey mullet, atherines, and soles; and, according to the figures given by M. Coste,† the average yield for the sixteen years from 1798 to 1813 amounted to 5 cwt. per acre, that is to say, double the weight of cheese or meat which could have been obtained from the same area of fair pasture land in the same time. Thus the seas around us are not only important sources of food, but they may be made still more important by the artificial development of their resources. But this Exhibition has brought another possibility within the range of practically interesting questions. A short time ago, a visitor to the market might have seen fresh trout from New Zealand lying side by side with fresh salmon, some of which came from Scandinavia and some from the lakes and rivers of North America. Steam and refrigerating apparatus combined have made it possible for us to draw upon the whole world for our supplies of fresh fish. In my boyhood, "Newcastle" was the furthest source of the salmon cried about the streets of London, and that was generally pickled. My son, or at any rate

* Sir James Caird and Mr. G. Shaw Lefevre, M.P. See the Report of the Commissioners appointed to inquire into the Sea Fisheries of the United Kingdom, 1866.

† Voyage d'exploration sur le littoral de la France et de l'Italie, 1855.

my grandson, when he goes to buy fish, may be offered his choice between a fresh salmon from Ontario and another from Tasmania.

The fishing industry being thus important and thus ancient, it is singular that it can hardly be said to have kept pace with the rapid improvement of almost every other branch of industrial occupation in modern times. If we contrast the progress of fishery with that of agriculture, for example, the comparison is not favourable to fishery.

Within the last quarter of a century, or somewhat more, agriculture has been completely revolutionized, partly by scientific investigations into the conditions under which domestic animals and cultivated plants thrive; and partly by the application of mechanical contrivances, and of steam as a motive power, to agricultural processes.

The same causes have produced such changes as have taken place in fishery, but progress has been much slower. It is now somewhat more than twenty years since I was first called upon to interest myself especially in the sea fisheries; and my astonishment was great when I discovered that the practical fishermen, as a rule, knew nothing whatever about fish, except the way to catch them.

In answer to questions relating to the habits, the food, and the mode of propagation of fishes—points, be it observed, of fundamental importance in any attempt to regulate fishing rationally—I usually met with vague and often absurd guesses in the place of positive knowledge. The Royal Commission, of which I was a member in 1864 and 1865, was appointed chiefly on account of the allegation by the line fishermen that the trawlers destroyed the spawn of the white fish—cod, haddock, whiting, and the like. But, in point of fact, the “spawn” which was produced in support

of this allegation, consisted of all sorts of soft marine organisms, except fish. And if the men of practice had then known what the men of science have since discovered, that the eggs of cod, haddock, and plaice float at the top of the sea, they would have spared themselves and their fellow-fishermen, the trawlers, a great deal of unnecessary trouble and irritation. Thanks to the labours of Sars in the Scandinavian Seas, of the German Fishery Commission in the Baltic and North Sea, and of the United States Fishery Commission in American waters, we now possess a great deal of accurate information about several of the most important of the food fishes, and the foundations of a scientific knowledge of the fisheries have been laid. But we are still very far behind scientific agriculture ; and, as to the application of machinery and of steam to fishery operations, it may be said that, in this country, a commencement has been made, but hardly more.

This relative backwardness of the fishing industry greatly impressed my colleagues and myself in the course of the inquiries of the Royal Commission to which I have referred ; and I beg permission to quote some remarks on this subject, which are to be found in our Report.

“When we consider the amount of care which has been bestowed on the improvement of agriculture, the national societies which are established for promoting it, and the scientific knowledge and engineering skill which have been enlisted in its aid, it seems strange that the sea fisheries have hitherto attracted so little of the public attention. There are few means of enterprise that present better chances of profit than our sea fisheries, and no object of greater utility could be named than the development of enterprise, skill, and mechanical ingenuity which might be elicited by the periodical exhibitions and publications

of an influential society specially devoted to the British Fisheries.”*

I trust that I am not too sanguine in looking upon the crowds who throng to the present remarkable Exhibition as evidence that public attention is now thoroughly attracted to the sea and other fisheries. As this is the third exhibition of its kind which has been held in these islands, I think I may say that the periodical exhibitions for which we ventured to hope have come into existence. And I am thereby encouraged to express a confident belief that our final anticipation will be realized; and that, in these Conferences, we have the germ out of which, by due process of evolution, a society specially devoted to the promotion of the interests of the Fisheries of these islands may spring.

Whether this vaticination is fulfilled or not, I think that the promoters of this Exhibition may be congratulated on the achievement of a success peculiar to themselves. So far as I know, in no preceding Fishery Exhibition has advantage been taken of the assemblage of so many representatives of fishery interests from all parts of the world—fishery knights and burgesses, if I may so call them—to form a Fishery Parliament such as that at the opening of which your Royal Highness presides to-day. Personally, I should have been very glad if the Conferences could have opened with a communication so full of interest and instruction as that which embodies the results of the practical acquaintance with the sea fisheries gained by His Royal Highness the Duke of Edinburgh during his three years of office as Admiral commanding the Naval Reserves, which you will have the pleasure of hearing to-morrow. But, since the duty

* Report of the Commissioners appointed to inquire into the Sea Fisheries of the United Kingdom, 1866, p. 17.

of opening the Conferences has been laid upon me, I must endeavour, after these preliminary remarks, to bring under your notice some topic of the same order as those which will be discussed in the conferences which follow. Of such topics I need hardly say that this Exhibition affords an abundant store. But I have been obliged to pass by many which, under ordinary circumstances, I should have gladly seized upon; because I should not like to be charged with an abuse of my opportunities as first comer by any of the twenty or thirty gentlemen who have undertaken to deal with the subjects of future conferences.

But on looking over the list of allotted subjects, I find there is yet one important topic unappropriated—unless it belongs to Mr. Shaw Lefevre, in which case I hope that my former colleague will forgive my depredations—and that is the question, WHETHER FISHERIES ARE EXHAUSTIBLE; AND IF SO, WHETHER ANYTHING CAN BE DONE TO PREVENT THEIR EXHAUSTION?

It so happens that I have had occasion to devote very particular attention to these questions, and to express definite opinions about them. And as these opinions seem to me to have been more often attacked than understood, I am glad to have the opportunity of briefly, but I hope clearly, submitting them, with the grounds on which they are based, to your judgment.

Are fisheries exhaustible? That is to say, can all the fish which naturally inhabit a given area be extirpated by the agency of man?

I do not think that this question can be answered categorically. There are fisheries and fisheries.

I have no doubt whatever that some fisheries may be exhausted. Take the case of a salmon river, for example. It needs no argument to convince any one who is familiar

with the facts of the case that it is possible to net the main stream, in such a manner, as to catch every salmon that tries to go up and every smolt that tries to go down. Not only is this true, but daily experience in this country unfortunately proves that pollutions may be poured into the upper waters of a salmon river of such a character and in such quantity as to destroy every fish in it.

In this case, although man is only one of many agents which are continually effecting the destruction of salmon in all stages of its existence—although he shares the work with otters and multitudes of other animals, and even with parasitic plants—yet his intelligence enables him, whenever he pleases, to do more damage than all the rest put together; in fact, to extirpate all the salmon in the river and to prevent the access of any others.

Thus, in dealing with this kind of exhaustible fishery, the principle of the measures by which we may reasonably expect to prevent exhaustion is plain enough. Man is the chief enemy, and we can deal with him by force of law. If the stock of a river is to be kept up, it must be treated upon just the same principles as the stock of a sheep farm.

If an Australian sheep farmer is to be successful in his business he knows very well what he has to do. He must see that his sheep have a sufficient supply of food, he must take care that a sufficient breeding stock is preserved, and he must protect his sheep from all enemies but himself. He must defend his sheep, young and old, not only against the ravages of the wild dog, against infectious diseases, and against parasites; but it is sometimes a very serious matter to protect them against the competition of other herbivorous animals, such as kangaroos, which appropriate the food destined for the sheep. And it is no easy matter to carry out an efficient system of protection. The destruction of

the wild dogs may lead to the over multiplication of the kangaroos, and the destruction of the kangaroos may lead the wild dogs to devote their energies too seriously to the sheep. If the sheepowner does not take care what he is about, his very sheep dogs may become disseminators of the staggers among his flock. Moreover, the sheepowner must not let the butcher take more than a certain percentage of his sheep for boiling down, or the stock will be unduly diminished. It is only by incessant attention to all these points that a sheep farmer is successful ; and, let him be as attentive as he likes, every now and then some variation in those conditions which are beyond his control—a sudden flood or a long drought, or the straying of a diseased sheep from another run—may bring him to ruin.

Now, if you will consider the action of the conservators of a salmon river, you will see that they, at any rate, strive to do for the salmon that which a careful shepherd does for his sheep. Obstacles in the way of free access to the breeding grounds are removed by the construction of fish passes ; the breeding stock is protected by the annual close time ; animals which prey on the fish, or compete dangerously with them, are kept down ; or the salmon are placed at an advantage by artificially stocking the river. Finally, the destructive agency of man, who plays the part of the butcher, is limited by removal of pollution—by the prohibition of taking parr and smolts—by the restrictions on the character and on the size of meshes of nets ; and, indirectly, by the license duty on nets and rods.

Whether the state of the law is such as to permit the work of the conservator to be carried out efficiently, or not, is a point which will, I doubt not, be fully discussed by-and-by. All I desire to show is that, in principle, the

measures adopted by the conservators, if they are to be efficient, must be identical with those of the sheep farmer.

And the analogy is complete, for when the conservator has done all he can, droughts, parasites, and other natural agents which are beyond human control, may nullify his efforts. In the case of the salmon, as in that of the sheep, careful and intelligent protection may promote the prosperity of the stock to any conceivable extent; but it cannot ensure that prosperity, nor prevent immense fluctuations in the yield from year to year.

A salmon fishery then (and the same reasoning applies to all river fisheries) can be exhausted by man because man is, under ordinary circumstances, one of the chief agents of destruction; and, for the same reason, its exhaustion can usually be prevented, because man's operations may be controlled and reduced to any extent that may be desired by force of law.

And now arises the question, Does the same reasoning apply to the sea fisheries? Are there any sea fisheries which are exhaustible, and, if so, are the circumstances of the case such that they can be efficiently protected? I believe that it may be affirmed with confidence that, in relation to our present modes of fishing, a number of the most important sea fisheries, such as the cod fishery, the herring fishery, and the mackerel fishery, are inexhaustible. And I base this conviction on two grounds, first, that the multitude of these fishes is so inconceivably great that the number we catch is relatively insignificant; and, secondly, that the magnitude of the destructive agencies at work upon them is so prodigious, that the destruction effected by the fisherman cannot sensibly increase the death-rate.

At the great cod-fishery of the Lofoden Islands, the fish approach the shore in the form of what the natives call "cod mountains"—vast shoals of densely-packed fish, 120 to 180 feet in vertical thickness. The cod are so close together that Professor Sars tells us "the fishermen, who use lines, can notice how the weight, before it reaches the bottom, is constantly knocking against the fish." And these shoals keep coming in one after another for two months, all along the coast.

A shoal of codfish of this kind, a square mile in superficial extent, must contain, at the very least, 120,000,000 fish.* But it is an exceptionally good season if the Lofoden fishermen take 30,000,000 cod; and not more than 70,000,000 or 80,000,000 are taken by all the Norwegian fisheries put together. So that one fair shoal of all that approach the coast in the season must be enough to supply the whole of the codfish taken by the Norwegian fisheries, and leave a balance of 40,000,000 or 50,000,000 over.

The principal food of adult cod appears to be herring. If we allow only one herring to each codfish per diem, the cod in a square mile of shoal will consume 840,000,000 herring in a week. But all the Norwegian fisheries put together do not catch more than half that number of herring. Facts of this kind seem to me to justify the belief that the take of all the cod- and herring-fisheries, put together, does not amount to 5 per cent. of the total number of the fish. But the mortality from other sources is enormous. From the time the fish are hatched, they are attacked by other marine animals. The great shoals are attended by hosts of dog-fish, pollack, cetaceans and birds, which prey upon them day and night, and cause a destruction

* This allows over four feet in length for each fish, and a yard between it and those above, below, and at the sides.

infinitely greater than that which can be effected by the imperfect and intermittent operations of man.

I believe, then, that the cod fishery, the herring fishery, the pilchard fishery, the mackerel fishery, and probably all the great sea fisheries, are inexhaustible ; that is to say, that nothing we do seriously affects the number of the fish. And any attempt to regulate these fisheries seems consequently, from the nature of the case, to be useless.

There are other sea fisheries, however, of which this cannot be said.

Take the case, for example, of the oyster fisheries, so far as it concerns beds which are outside the three-mile limit of the territorial jurisdiction of this country. Theoretically, at any rate, an oyster bed can be dredged clean. In practice, of course it ceases to be worth while to dredge long before this limit is reached. But we may assume, for the sake of argument, that an oyster bed may be thus stripped. In this case, the oyster bed is in the same position as a salmon river. The operations of man bear a very large proportion to the sum of destructive agencies at work, and it may seem that restriction by force of law should be as useful in the one case as in the other.

But it must not be forgotten that the efficacy of salmon protection depends on its completeness. What would be the value of the Salmon Acts if they contained only two provisions—the first that there shall be an annual close time, and the second that no parr or smolts shall be captured ? Is it not obvious that there would be as good as no protection at all, inasmuch as every salmon that tried to ascend the river might be captured during the open season, and then, of course, there would be neither breeding fish nor smolts to protect ?

And yet this is all that the restrictions on oyster fishing enforced in this country have ever aimed at.

At one time, we enforced an annual close time, and we said that oysters below a certain size should not be taken ; but I am at a loss to divine how the strictest enforcement of these regulations could prevent any one from stripping a bed bare of every adult oyster during the open season. But the interference with the removal of oysters below a certain size is so obviously a measure in the interest of dog-whelks and star-fish, and against man, that we have given that up, and now we only insist upon the four months' close time ; which appears to me to be just as rational as it would be to prohibit the catching of salmon in December January, and February, and permit the destruction of young and old by all imaginable means and to any extent, during the rest of the year.

The only protection of oysters which can possibly be efficient is some such system as that pursued in Denmark and in France—where the beds are the property of the State—where an estimate is made of the quantity of oysters in a bed—and where fishing is permitted only to the extent justified by that estimate.

How far the results of such a system of protection of oyster beds justify its adoption is a question which I will not at present attempt to discuss ; but I think it must be perfectly clear to every one acquainted with the circumstances of our deep-sea oyster beds, that it is utterly impracticable to apply any such system to them. Who is to survey these beds ? Who is to watch them ? Who is to see that the dredgers do not take more than their allotted share ? Who is to prevent fishermen sailing under the flag of a nation with which we have no fishery convention, from disregarding our regulations ?

Thus I arrive at the conclusion—first, that oyster fisheries may be exhaustible; and secondly, that for those which lie outside the territorial limit no real protection is practically possible. In the case of the oyster fisheries which lie inside the territorial limit the case is different. Here the State can grant a property in the beds to corporations or to individuals whose interest it will become to protect them efficiently. And this I think is the only method by which such fisheries can be preserved.

I have selected the oyster fisheries as those sea fisheries, for the possible exhaustion of which there is most to be said. I have no doubt that those who take up the subjects of trawling and of the shell fisheries will discuss the question in relation to those fisheries. All I desire to remark is, that if any of these fisheries should prove to be exhaustible, and in course of exhaustion, close time and the restriction of the size of fish taken cannot save them, unless those measures are accompanied by the limitation of the number of fish taken during the open season. And in the case of trawling, I am quite unable to imagine how such a limitation could be practically enforced.

I have ventured to dwell upon this topic of the exhaustibility of fisheries at some length, because it is of great importance, not only to the consumer, but to the fisherman. It is to current opinion on this subject that we owe fishery legislation. Now every legislative restriction means the creation of a new offence. In the case of fishery it means that a simple man of the people, earning a scanty livelihood by hard toil, shall be liable to fine or imprisonment for doing that which he and his fathers before him have, up to that time, been free to do.

If the general interest clearly requires that this burden should be put upon the fisherman—well and good. But

if it does not—if, indeed, there is any doubt about the matter—I think that the man who has made the unnecessary law deserves a heavier punishment than the man who breaks it.

COUNT MÜNSTER (German Ambassador) proposed a vote of thanks to Professor Huxley for the very able and interesting address he had delivered—a motion which he was sure would meet with universal approval. His Royal Highness had told them that the practical part of the Exhibition had already proved a great success, more than half a million of people having come to witness what was exhibited in so agreeable a manner. He had always been convinced that the importance of the fishery industry could not be over-estimated, and had done his best to impress this truth on his own countrymen. He was certain that every fisherman, whether professional or amateur, could learn a great deal there, but he could not learn it properly without the assistance of science. The scientific department of the Exhibition had now been opened, and it must be considered a very good omen that a man of such high standing as Professor Huxley had delivered the opening address.

LORD NORTHBROOK, in seconding the resolution, said he was sure he was only expressing the views of all present when he ventured the opinion that His Royal Highness could not have made a more admirable choice in the gentleman whom he and the Committee had selected to open the Conference. Professor Huxley, from his original connection with the sea, from his high scientific attainments, from having been associated in the past with scientific inquiries into this subject, and from his present official position, was most admirably suited for this post, and he need hardly

say that he had most excellently fulfilled the duty which devolved upon him. He should not attempt to enter into any of the questions which had been mentioned, but it had given him great satisfaction to be present, not only on account of the essentially practical character of the Conference, but because as a member of the Legislature he had received advice from Professor Huxley which he should carry away with him and endeavour to put in practice.

The resolution was carried unanimously.

MUSURUS PASHA (Turkish Ambassador) then proposed a vote of thanks to His Royal Highness the Prince of Wales for presiding at the inauguration of the International Congress

LORD GRANVILLE seconded the resolution. He had no doubt that the Prince would highly appreciate the compliment which had been paid to him by his distinguished friend the Ambassador of Turkey, who represented those foreign gentlemen whom they were so glad to see, and who had added greatly to the interest of the Congress by their presence. If he might be allowed to represent His Royal Highness's countrymen, he felt that he might abstain from any mere compliment, and merely acknowledge one remarkable characteristic of His Royal Highness, which he believed to be one of the causes which had added so much to his great popularity. He referred to the desire he had evinced ever since he came of age to take part in every useful work which was open to him, considering his exalted position. And in doing so he had shown remarkable discrimination in selecting the objects with which he associated himself, and had shown not simply a spasmodic, but a continuous and persevering, interest in any work of the *kind until it was successfully terminated*. He remembered

a great authority with regard to public meetings saying that what the people desired was not to be instructed, but to be excited and amused. Now he never knew a man who could better than Professor Huxley condense in a very small space the instruction which people did not want, with a due proportion of the pleasure and amusement which they did. He ventured to think that after his address, at all events until it had been answered, there could not be the slightest doubt of the importance of the object with which His Royal Highness had been good enough to associate himself. With regard to the continuous attention His Royal Highness paid to such enterprises, he would merely refer to the interest which he and the Princess of Wales had shown with regard to the local exhibition at Norwich, which had developed itself, on the principle so successfully laid down by the late Prince Consort, into an International Exhibition. They all knew the impulse which he gave to the work when he presided at the first meeting on the subject, and the grace with which he represented Her Majesty on the occasion of the opening. The same thing was applicable to his position to-day. The scientific and didactic part of the work was now begun, and he therefore had the greatest pleasure in seconding the resolution.

The resolution was then put by LORD GRANVILLE, and carried unanimously.

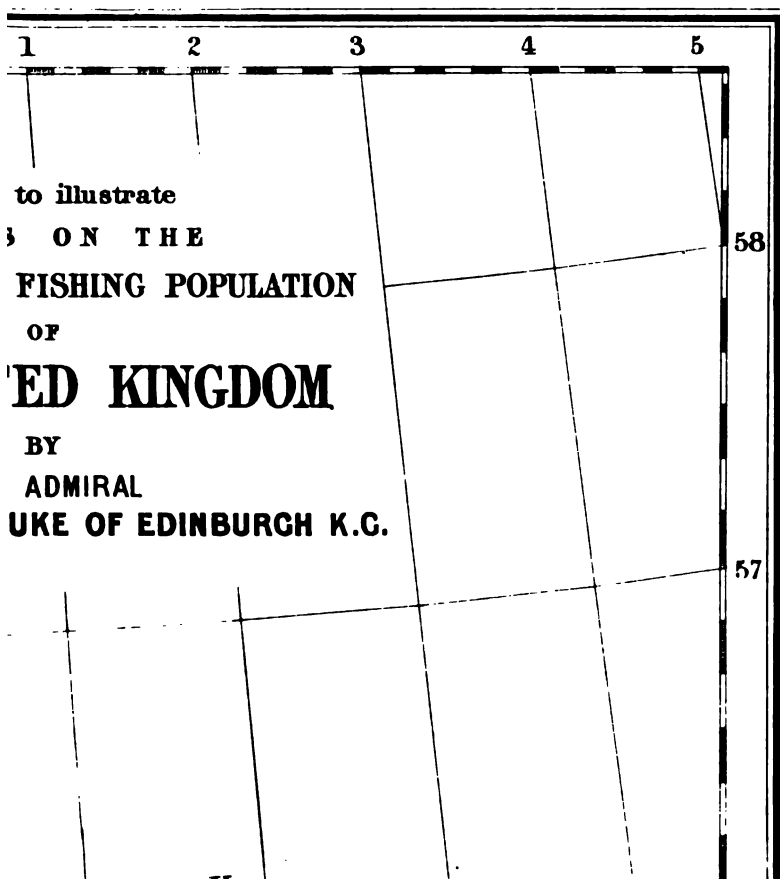
H.R.H. THE PRINCE OF WALES, in responding, thanked the Turkish Ambassador and Lord Granville for the kind manner in which they had put the resolution, and the meeting for the way in which it had been received. It had been a source of great pleasure to him to be present at the first meeting of the Congress, and also to join in the vote of thanks which had been given to Professor Huxley for his

excellent address. He did not think anything could have been more successful, or that the duty could have been entrusted to abler hands. He had only to announce that the next meeting would take place on the following day at 12 o'clock, when he should have the pleasure of reading a paper by his brother the Duke of Edinburgh, on "British Fisheries and Fishermen." He regretted that absence in Russia prevented his brother being present and reading it himself, but he should endeavour to supply his place to the best of his ability

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NOTES
ON THE
SEA FISHERIES AND FISHING POPULATION
OF
THE UNITED KINGDOM.

ARISING FROM INFORMATION AND EXPERIENCE GAINED
DURING THREE YEARS' COMMAND OF THE
NAVAL RESERVES.

BY
VICE-ADMIRAL
H.R.H. THE DUKE OF EDINBURGH, K.G.

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CONFERENCE ON TUESDAY, JUNE 19, 1883.

H.R.H. THE PRINCE OF WALES read the Paper which had been prepared by H.R.H. the Duke of Edinburgh on "British Fisheries and Fishermen."

NOTES ON THE SEA FISHERIES AND FISHING POPULATION OF THE UNITED KINGDOM.

IN fulfilment of my intention expressed at the public meeting held at Willis's Rooms on the 27th of February, 1882, for the promotion of this Exhibition, it will now be my endeavour to place before you an account of the extent and condition of our fishing population, with a view to interest you in its welfare and to draw your attention to the great importance of our sea fisheries.

In order clearly to point out the hardships, dangers, and disadvantages to which our fishermen are exposed, and to draw attention especially to those occurrences which are in a measure preventible, more particularly where lives are apparently needlessly sacrificed, I have thought it best to accompany my remarks by some slight account of the principal kinds of fisheries in which the men are engaged. This account, though very imperfect, may also perhaps be of service to those quite unacquainted with the subject

when inspecting all the appliances for the capture of fish which are exhibited in this splendid range of buildings.

My paper has thus become much larger than I intended ; I have therefore divided it into two parts, the first of which, relating more particularly to the fishing population, I will now read.

In dealing with the enormous mass of statistical information which has been furnished to me from different points on the coast, I have often felt the great disadvantage of want of experience in work of this kind ; but I have in this paper attempted to furnish you with an idea of the great importance to the nation of the prosperity of our fishing industry.

It appeared to me that, to arrive at a just appreciation of this importance, you should have brought under your notice facts as to the number of persons dependent upon fishing for their livelihood, the methods of capture employed, the description and number of boats and vessels used, the quantities of fish taken annually, the manner of its disposal, and its commercial value.

If I succeed in imparting information to any of my hearers or readers, or in suggesting to their minds any ideas for the moral or material benefit of our fishing population, or the diminishing of the dangers to which our fishermen are exposed ; for the improvement of the fishing-vessels and boats, for the further development of the fishing industry, either by improved methods of capture or otherwise, which it is the object of this Exhibition to promote,—it will be a source of great satisfaction to me.

Throughout the period of three years, commencing November, 1879, during which I held the command of our Naval Reserves, my duties necessitated my frequent presence on the British coasts, both by sea and by land,

giving me occasion to visit a very large number of our fishing villages.

I was thus afforded opportunities of observing our fishing population in the labours of their occupation afloat and ashore, and of realising more and more thoroughly the great importance of our sea fisheries, as one of the many forms of that maritime industry the steady pursuit of which has contributed so much to the welfare, prosperity, and glory of the British Empire.

Our sea fisheries are of great importance, not only in obtaining for us a considerable portion of our food supply, but in providing a means of subsistence for a large section of our population, and in keeping within our borders a skilful, brave, and hardy race of seamen, trained from their earliest boyhood to seek their livelihood from, and to contend with, the most stormy and tempestuous of seas.

My duties, however, obliged me to be so constantly moving from place to place when on the coast, that it was not in my power to obtain personally all the information I required relating to our fisheries and fishermen. I therefore requested the Divisional and Station Officers of H.M. Coastguard to make inquiries within the limits of their several commands, to collect statistics relating to the sea fisheries of their vicinity, and to furnish me with such information as they could obtain on the subject. I also addressed a similar request to the officers in command of H.M. revenue cruisers.

I take this opportunity of expressing to the officers above referred to, my appreciation of the careful and painstaking manner in which they collected the information I asked them for, and for the very valuable observations and suggestions with which, in many instances, the statistical returns were *supplemented*.

These returns were furnished from nearly 800 different places on the coasts of the United Kingdom, the majority of which had some interest, though it might be a very small one, in our sea fisheries.

Even then I found that some very important centres of the industry were not included in the returns at my disposal ; for information with regard to these I had to depend on other authorities and apply to other sources. For the kindly manner in which my appeals were responded to I must here express my sincere thanks.

The wonderful development of the railway system in these Islands which has taken place in the course of the last fifty years has amongst other benefits had the effect of familiarising the present generation, even those residing at places the farthest removed from the coasts, with the various species of fish inhabiting our seas which are used as food.

Fish which are to-day disporting themselves in their native waters off Wick, in the extreme north of Scotland may be to-morrow displayed on the slabs of the fish-mongers' shops in Birmingham, Bath, or Taunton ; the cod to-day on the Dogger Bank may be to-morrow in Stafford with a lobster from the Hebrides at its head, a barrel of oysters from Whitstable at its tail, whilst a mackerel from Kinsale and a hake from Mount's Bay may repose on either side of it.

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In stating that over half a million of our fellow-subjects depend each day for their bread upon the fish taken from the sea over night, I allude only to the fishermen, their wives and families, and do not include the buyers, curers, gutters, coopers, carters, porters, boat-builders, net-makers, wholesale and retail dealers in the towns, with their assistants, and various others more or less dependent on the success of our fisheries for a livelihood. The very wide distribution of the persons engaged in these different callings places them outside the scope of my observations. It is to the fishermen themselves that I wish to draw your attention.

The number of men and boys engaged in the capture of fish on our coasts may be estimated at about 113,640, distributed in the following manner :—

England.	41,300
Scotland.	48,100
Ireland	19,800
Isle of Man	2,840
Channel Islands	1,600

The majority of the English, Scotch, and Manx fisher-

men follow fishing as their sole occupation, although a certain proportion of the Scotchmen fish only during the herring season, when they engage themselves at a certain weekly wage in the boats ; whilst in Ireland a very large number of men fish only at such times as there is a visible chance of a good take.

At watering-places men often divide their attention between plying for hire in the summer season, and fishing during the rest of the year ; and at many small ports they fish only when they cannot obtain employment about the shipping.

The application of the word fisherman, as indicating a man's occupation, is therefore somewhat elastic ; and the extent to which the individual depends upon fishing for his livelihood is very variable.

Out of the 113,640 men and boys described as engaged in the capture of fish, I estimate that about 90,000 are *bond fide* fishermen ; that is, men engaged in fishing from year's end to year's end, who only desist from their occupation when compelled by stress of weather, or by the short intervals between the termination of the season for the capture of one species of fish and the commencement of that for the capture of its successor. Of the remaining 24,000 some derive only half their living from fishing, and others even much less.

Fishermen, as a class, make early marriages ; large families are the rule rather than the exception, as will be sufficiently evident to any visitors to a fishing village ; very gennerally there are four, often five or six, children in a family.

We will take the average of a fisherman's family to be husband, wife, and four children—six in all. This will give us a total of 540,000 souls, the satisfaction of whose

daily wants depends immediately upon the successful labours of the 90,000 *bonâ fide* fishermen included in that number.

The most unremitting toil on the part of these fishermen but just suffices to supply those wants; toil which exposes the men to dangers and to hardships of which only those who have a close and a familiar knowledge of the sea in its various moods can form an accurate conception.

In winter cold and summer heat, almost every port and bay sends out daily to the fishing grounds its fleet of boats, manned by their keen and eager crews prepared to face almost any emergency in their efforts to wrest its treasures from the deep.

In the brightness of a July evening, when the sea is barely rippled by gentle airs, which spring to life and die away in a succession of lovely cadences, no more beautiful spectacle can be seen than that of a large fleet of fishing-vessels, gliding with almost imperceptible movements from the land towards the hazy and distant horizon. At such times a fisherman's life appears an idyll. Not less interesting is the scene in the early waning of a winter's day, when the pale and fleeting glimpse of sunshine lights the heaving surface of the sea, and the boats, heeling to the force of a blustering December breeze, seem to spring from wave to wave as though endued with the life, and eager desire to excel, of a racehorse. At such a time, the thought of the long hours of darkness of the winter's night to be passed by their crews, cold, wet, and liable to many dangers, will bring home fully to one's mind the toilsome nature of a fisherman's occupation.

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On our exposed and stormy coasts the return of the boats is often awaited with anxious forebodings by the

wives and children on shore. On starting from the harbour for the fishing grounds, a clear sky and gentle breeze may appear the sure signs of settled weather ; the nets or lines may be shot under most favourable circumstances with every hope of a successful haul of fish. Of a sudden, almost without any warning, a gale springs up, the heavens become overcast, the darkness deepens, the ocean begins to throb uneasily, ever increasing its agitation until its surface becomes broken with black angry waves, here and there topped by white hissing crests. Matters become so serious that instant endeavours have to be made to secure the nets or lines. Often, however, the change is so rapid that to persist in the attempt would endanger the safety of the boat and its crew, and great loss has to be incurred in abandoning the gear, when all haste is at once made for the land.

On shore the howling of the wind will have alarmed the wives and families of those afloat. Before dawn they will be found gazing to seaward with anxious eyes, endeavouring to pierce the darkness which hangs like a pall over the waters ; seeking to catch a momentary glimpse, as it tops a wave, of the boat which contains the breadwinner. In their thoughts hope and fear alternate.

As the darkness pales, and is succeeded by the dawn, one by one the boats become visible to these trembling watchers, appearing first as black specks on the horizon, which enlarge and become more distinct as the light increases, until their numbers can be counted, and the boats distinguished by their various slight peculiarities.

As the little craft approach the harbour, their movements are followed by the wives and mothers of those on board with a concentration of attention possible only in a woman who knows that in each shrieking squall or

breaking sea may be borne the doom of her husband or her son.

On board the boats the crews will be found sitting well down, as much under shelter as possible, still and quiet, but on the alert, ready to spring into activity at the order of the master who is at the helm. The little vessel's sails are close reefed, but, urged by the pressure of the wind, she seems to bound over the seas, now poised on the crest of a wave, next rushing madly down its steep incline as though she would engulf herself in the dark valley beneath, then she overtakes and struggles up the steep ascent of another mountain of water.

So the struggle of man and man's handiwork against the power and fury of the elements is carried on, until, by the mercy of God, the boat and crew reach the safety and shelter of the port.

Our storm-beaten and iron-bound coasts are frequently the scenes of dangers such as I have just imperfectly described ; and we must all from time to time, by means of our daily papers, have been made familiar with the details of the disasters to our fishing-fleets overtaken at sea by sudden gales. These disasters are more fatal in the summer months ; for, although storms are then rarer than in winter, they give but little or no warning of their approach, and burst in irresistible might on the unfortunate craft which, but a few minutes before, had been riding in fancied security at their nets.

In no section of our population is heredity of occupation so rigidly preserved as amongst our fishermen ; they are a class apart, intermarrying, having their own peculiar customs, modes of life and thought, and mixing but little with people outside their own little communities. They have also their own *peculiar* superstitions, but these are *rapidly disappearing before the spread of education.*

From the earliest ages the inhabitants of the coasts of the British Islands have made the sea contribute to their food ; this pursuit has produced a race of men—strong, inured to hardship and exposure, patient and persevering in their calling, brave, prompt, and full of resource in the face of danger ; intelligent and amenable to discipline, from the daily habit of subordinating their own wills to that of one who they know is placed in authority over them for the purpose of directing their labours, and working with them for the common benefit ; accustomed to co-operate with others for the attainment of a certain end.

These qualities are not only exercised from earliest youth, but are inherited and intensified from generation to generation.

The foundations of the great position which this kingdom has attained amongst the nations of the world must in some measure be attributed to our fishermen, for they were our first seamen ; and from small beginnings our seamen increased in number and in skill, until the whole nation was leavened with that love of maritime adventure which has resulted in peopling the uttermost parts of the earth with our race, and in establishing that empire upon which the sun never ceases to shine.

In earlier times, our first maritime commerce must have been conducted by our fishermen, who also manned our fighting navies. The fisheries of the West of England were the nursery of the sailors who enabled Drake to circumnavigate the world, and, as he said, to “sing the King of Spain’s beard” on more than one memorable occasion.

Within the last few years the connection of our fighting navy with our fishermen has been, to a slight extent, revived by the establishment of the Royal Naval Reserve of the second class, which is recruited chiefly from amongst

these men. In the course of my inspections of the various drill ships and batteries, appropriated to the training of the Naval Reserve, a large number of fishermen came under my observation ; considering their opportunities I found that they had, as a rule, a good knowledge of their naval duties, and that they performed them with alacrity and steadiness, which could only be attained by close attention to, and a lively interest in, the instruction imparted to them. The officers charged with their instruction, without exception, spoke favourably of them.

Great as are the risks inseparable from the fisherman's vocation, yet the men are daily exposed, or expose themselves, to dangers which might be avoided, but which at present result in lamentable loss of human life.

Foremost amongst these is the practice technically termed "ferrying," carried on in the trawling fleets in the North Sea, and it is one of the most serious of these avoidable dangers, demanding careful investigation and consideration, to which I desire to direct especial attention.

It is the custom of the North Sea trawlers to remain at sea for some two months at a time throughout the year. On these prolonged cruises a large number of trawlers will be assembled together, forming a fleet ; the vessels composing this fleet may belong to several different owners, but they work together under the directions of an experienced master, who is termed the admiral.

A number of steamers or smacks attend on this fleet, for the purpose of conveying the fish which have been caught to the most convenient harbour, whence it can be despatched to the markets ; these vessels are called "carriers." Were it not for this system of carrying, the trawlers would either have to cure the fish taken by

them on the distant fishing grounds, or much time would be lost by each vessel having to bring her own catch to land in a fresh state.

The value of the fish for food purposes depends entirely on its being brought within reach of the consumers in a fresh condition ; every hour that elapses from the time of its removal from the sea lessens this value, and its perishable nature renders rapidity of conveyance a matter of the highest importance. On board each fishing-vessel, therefore, the arrival of the "carrier" at the fleet is the signal for the most strenuous exertions.

The small boat is got alongside, manned, and the boxes of fish are tossed on board her, perhaps, if the catch has been a good one, piled high above the gun-wale, lading the boat so heavily as to make it quite a matter of chance whether she will be sufficiently sea-worthy not to swamp or capsize whilst on her way to the carrier. As the boats from the different trawlers approach the carrier they become a source of danger to one another, from the heedlessness of the crews and the anxiety to be first to reach the lee-quarter of the vessel, where the bowman of the boat hangs on with his bow-fast, whilst the other two men pass the fish-boxes on board.

This work is carried on in almost all states of weather ; such is the importance attached to the immediate despatch of the fish that the men never seem to think of the possibility of danger to themselves. I have heard of a trawler's boat, with its cargo and crew, being actually lifted by a sea to the deck of the carrier and there left. In many cases the boats are cast off from the carrier a long way to leeward of their respective trawlers, and even occasionally with their heavy loads of fish still on board, the decks of the carrier being fully laden. In the excitement and struggles of a

large number of these tiny boats, each of which is striving for the first place, or in the subsequent endeavours to regain their own vessels, accidents are necessarily of frequent occurrence, too often attended by loss of life.

No one will deny the great importance to the owners of the smacks of getting their fish to market in a saleable condition, but they are bound to effect this object without exposing the fishermen to preventible dangers, such as I have above indicated, but against which no means of prevention have as yet been devised or adopted. I have alluded to this subject here as an illustration of the risks of a fisherman's life, and cannot leave it without expressing my opinion in favour of a careful and searching inquiry being made on each occasion on which a fishing-vessel returns to port having lost any of her crew whilst at sea. This inquiry, it seems to me, should be conducted by a competent authority, whose duty it should be to satisfy himself and place on record the manner in which the life was lost, whether by one of these preventible causes or not. For at present, the fact of a life being lost at sea is the only record which exists, no matter how it occurred.

Several cases of cruelty to boys engaged in fishing-vessels having come to light, two of which resulted in convictions for murder, whilst in another instance the skipper and the second and third hands of a smack were convicted of "cruel, debasing, and disgusting treatment of two lads at sea;" and numerous cases of desertion having been reported to have taken place amongst the crews of fishing-vessels,—a Committee was appointed in the year 1882 to enquire into and report upon these and other subjects connected with the sea-fishing trade.

This Committee having visited, and held inquiries at the Ports of *Hull*, *Grimsby*, *North Shields*, *Scarborough*,

These returns were furnished from nearly 800 different places on the coasts of the United Kingdom, the majority of which had some interest, though it might be a very small one, in our sea fisheries.

Even then I found that some very important centres of the industry were not included in the returns at my disposal ; for information with regard to these I had to depend on other authorities and apply to other sources. For the kindly manner in which my appeals were responded to I must here express my sincere thanks.

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trawlers are engaged in the North Sea fisheries. Its fishing vessels number 2676, its fishermen 14,100.

The Newhaven district, with 1371 fishing-vessels and 3350 fishermen, commences at Dover, extends to Christchurch in Hampshire, and includes the Isle of Wight.

The Weymouth district, having 3305 fishing-vessels and 7300 fishermen, extends from near Christchurch, around the Land's End to St. Ives in Cornwall; it contains the very important trawling ports of Brixham and Plymouth, and numerous villages from which the Drift fishery is energetically followed.

The Liverpool district includes the whole of the west coast of England, from St. Ives to the Solway Firth. It has 1166 fishing-vessels and 3300 fishermen.

Scotland has 15,049 fishing-vessels, manned by 48,100 fishermen; whilst Ireland numbers 5513 fishing-vessels, and 19,800 fishermen.

England, Scotland, and Ireland number amongst them 32,678 fishing-vessels and 109,200 fishermen.

In two years the casualties to fishing-vessels, of which I was able to obtain information, numbered 1099, giving an average of about 550 per annum; and a ratio of 16·8 casualties per 1000 boats per annum. Taken by districts already defined, the casualties to boats were—

	In Two Years.
Hull	73
Harwich	53
Newhaven	10
Weymouth.	126
Liverpool	14
England	276
Scotland	356
Ireland.	467
<i>Total</i>	1099

The number of casualties per 1000 boats per annum was—

Hull	10·15
Harwich	10·00
Newhaven	3·65
Weymouth	19·06
Liverpool.	6·00
England	11·39
Scotland	11·83
Ireland	42·35
United Kingdom	16·81

The large ratio of casualties to Irish boats is to a great extent attributable to destruction caused by unusually high spring tides, accompanied by gales, during which the boats were washed off the beach, and drifted away to sea.

The majority of the Irish fishing-boats destroyed in this way were open rowing boats, locally known as "canoes." They are of small size, and generally carry four men each.

The numbers of lives lost amongst the fishermen during two years were—

Hull	254 or 127 per annum.
Harwich	319 " 159·5 "
Newhaven	5 " 2·5 "
Weymouth	33 " 16·5 "
Liverpool.	13 " 6·5 "
England	624 " 312·0 "
Scotland	173 " 86·5 "
Ireland	60 " 30·0 "
	857 " 428·5 "

The ratios of loss per 1000 men per annum were—

Hull	9'58
Harwich.	11'31
Newhaven	0'75
Weymouth	2'26
Liverpool	1'97
England.	7'55
Scotland.	1'8
Ireland	1'5

United Kingdom, excluding Channel
Islands and the Isle of Man. . . . 3'9

I do not intend to take up your time by deploring such mortality, but will proceed at once to point out the conclusions which may be derived from it.

We have seen that the ratio of loss per 1000 amongst 41,300 English fishermen is 7'55 per annum; whilst Scotland, with 48,100 fishermen, only loses 1'8 per annum.

No one can imagine for one moment that the Scotch fisheries are prosecuted with less energy than the English, or that on these coasts the weather and the sea are more tempestuous than on those.

Neither can it be said that the Scotch fishing-vessels are more seaworthy than the English.

The Commission appointed by the Board of Trade, which sat in the latter part of 1882, stated in its Report that there were probably no more seaworthy vessels in the world than the North Sea trawlers; and many persons consider that the sea-going qualities of the Scotch drift boats would be much improved if certain details of the English boats were adopted.

What, then, is the cause of this greater loss of life amongst English fishermen?

We will take first of all the two districts, Hull and Harwich. Between them there are 6274 fishing-vessels, of which 63, or 10 per 1000, met with casualties in the course of one year; and there are 27,350 fishermen, of whom 286·5, or 10·475 per 1000, lose their lives annually in pursuit of their occupation.

Taking the rest of the English coast, from Dover to the Solway Firth, we have 5842 fishing-vessels, meeting with 75 casualties annually, equal to 12·84 per 1000; and 13,950 men, of whom only 25·5, or 1·84 per 1000, are lost annually.

It will thus be seen that, excluding Hull and Harwich districts, the ratio of loss of life amongst fishermen is very much the same in England as in Scotland, and that it slightly exceeds the rate of death from accident amongst railway servants, which is about 1·48 per 1000.

Except on the east coast of England, the loss of life amongst the fishermen of the United Kingdom, whilst in pursuit of their calling, cannot be looked on as excessive, considering that some extra risk to human life is inseparable from the occupation, especially in such stormy seas as ours.

We have now to seek the causes of this loss of life amongst the east coast fishermen, amounting to 286 per annum out of 27,350 souls, equal to a death-rate of 10·475 per 1000, nearly a moiety of the annual death-rate of the twenty principal towns in the United Kingdom, which is 21·7 per 1000.

I have found it impossible to obtain information which would justify me in arriving at a definite conclusion as to the cause of this excess in the rate of fatality to the men employed in the fishing-vessels in the North Sea; I therefore approach the *subject with great diffidence*.

The proportion of casualties to *fishing-vessels* is rather less in these waters than in other parts of the narrow seas, being as 10 to 12 per 1000 boats ; it would appear, therefore, that the cause of the excess in the loss of life must be sought elsewhere than in connection with disasters occurring to the vessels.

The vessels engaged in the drift fisheries off these coasts are as seaworthy as the Scotch boats, perhaps more so, and are found capable of making considerable voyages ; such being the case, it seems unlikely that they should lose a larger proportion of men in what may be termed their home waters, than do the boats similarly engaged in Scotland and the rest of England.

The other two systems of fishing followed off the east coast of England are trawling and "great-line fishing," both of which are pursued on the banks at a considerable distance from land.

The pursuit of each of these systems is attended by a peculiar source of danger to human life.

The "great line" fishing-vessels employ some seven miles of fishing-line each ; it is the custom to detach two of the crew in a small boat to lay out and haul in the lines.

In carrying out this duty the boat often becomes separated by a distance of some miles from the parent vessel, and is exposed to great danger should bad weather or fog suddenly spring up.

The North Sea is at all seasons liable to both.

Amongst the trawling fleets prevails the system of "ferrying," to which I have elsewhere referred, and the dangers of which I have pointed out.

As the east-coast hookers as well as the trawlers are remarkably good sea-boats, and are not subject to a greater percentage of casualties than other fishing-vessels, I fear

therefore that these peculiar customs must be held responsible for the excessive loss of life amongst the fishermen by whom they are followed.

In connection with this subject I have made a calculation of the quantity of fish captured in each district for each fisherman's life lost in one year ; which is also embodied in the tabular statement to which I have before alluded. These are the results :—

Hull	1,089 tons
Harwich	720 „
Newhaven	3,869 „
Weymouth	5,931 „
Liverpool	1,775 „
England	1,193 „
Scotland	2,506 „
Ireland	865 „
United Kingdom, excluding Channel Islands and Isle of Man	1,435 „

This again places the Hull and Harwich districts in the worst position of any part of the English coasts.

Peculiarly exposed to danger as our fishermen are, toiling hard for a living for themselves and their families, sometimes earning large sums in a night, at others obtaining but a few shillings for week after week of labour, their average gains during a year are not large, and too often the occurrence of a sudden storm deprives many a wife of her husband, many a child of its father, plunging the widow and the orphan into that gulf of destitution which is ever yawning beneath the feet of those who have not learned to exercise self-denial in the day of their prosperity.

In our fishing communities, fortunately, the families are so connected with one another, each is at any moment so liable to sudden bereavement, that the sorrow of one is

shared by all ; and the immediate wants of widows and orphans are relieved and alleviated, as far as lies in their power, by kind and sympathizing neighbours. When all are equally poor this is apt to be a heavy burthen, but it is a burthen borne cheerfully ; what is bestowed, is bestowed ungrudgingly and in kindness.

Fishermen do not as a rule make provision for those who will be left behind, should they themselves be suddenly taken away. The prevalence of the custom of mutual relief may have induced a habit of carelessness in this respect, but there is no security that this custom will always continue in the future. As our life becomes more complex in its civilization, a time may come when, even in our fishing villages, the ties which bound in the past and even now bind these little communities together, will be loosened, and when there will no longer be the same influences at work to produce, between family and family, that feeling of sharing in each other's joys and sorrows which now exists amongst them.

This is a contingency which it is necessary for our fishermen to face, and I think the time has arrived when they should add one more to their other good qualities, and resolve within themselves to adopt the prudent plan of making some little provision for their wives and children, or for their old age when they will be obliged to give up active work.

I am certain that, if they will take thought on this matter, they will see their way to carrying into effect a system of insurance. Having done so, the knowledge that wife and children will not be left homeless, destitute, and hungry, will be a great comfort to the husband and father in the moment of his peril ; or, if spared to old age, it will be a great satisfaction to him to feel that his own labours have brought rest and repose, and that he is not a *dependant* or a *burthen* on others. But small self-denial would

be required to enable him to pay the weekly or monthly subscription or premium necessary to ensure it.

In some of the centres of our fishing industry attempts have already been made in this direction, but they have not in all cases been successful ; I think one reason for the failure may be found in the fact that the fishermen have never thoroughly understood that they must rely on their own efforts in making provision for their families.

Let us for a moment consider what takes place when a storm of unusual severity, accompanied by great loss of life and property, has swept our coasts. The magnitude of the disaster is enlarged upon in the daily press. Morning after morning, the sympathies of the public are excited by vivid descriptions of the distress and sorrow of those who have suffered bereavement ; committees are formed, and subscription lists opened, in London and throughout the country ; money pours in from all quarters, and relief is given promptly and effectively. This is as it should be ; and, as a nation, we may be very thankful that we are thus enabled to meet such emergencies.

But many and many a fisherman's life is lost at sea, of which the public hears nothing. A sudden lurch of the boat on a dark night, a stumble on the wet and slippery deck, a blow from a flapping sail, rope or block, or from the boom in an unexpected jibe ; then an instant's struggle, encumbered by heavy boots and waterproofs, and one more is added to the number of those lost in this calling.

In these individual cases no appeal is made to the charity of the public : the widow and orphans have to face the world, penniless and destitute—except for the slight assistance of neighbours almost as poor.

Nothing but the resolution of the fishermen themselves can insure provision for these cases, which, in the aggregate, far exceed in number those due to great disasters.

Any society or company instituted to provide for these contingencies should be entirely self-supporting ; its rules for admission should be few and simple ; to as great an extent as possible subscribers should be enabled to pay their premiums without going far from their homes ; for a given premium an absolute sum should be assured in the event of certain occurrences ; it should be illegal to assign this sum for the payment of debts, and the widow or representatives of the deceased man should be placed in possession of it with as little delay as possible.

As an instance of what might be done in this direction, I will mention the "Coastguard Life Insurance Fund," of which I was one of the Trustees during the time I held the command of the Naval Reserves.

This fund, registered under the "Friendly Societies Act," was established in the year 1878. It had no capital, but depended entirely on the subscriptions of its members for the means of meeting its liabilities. Membership is limited to officers and men belonging to Her Majesty's Coastguard Service.

The subscriptions were fixed at the following rates, viz. :

Age on Joining.	Sum Payable at Death.							
	£	s.	£	s.	£	s.	£	s.
Over 23 and under 25	16	0	32	0	48	0	64	0
Under 28	15	0	30	0	45	0	60	0
" 30	14	0	28	0	42	0	56	0
" 33	13	0	26	0	39	0	52	0
" 35	12	0	24	0	36	0	48	0
" 38	11	0	22	0	33	0	44	0
" 40	10	0	20	0	30	0	40	0
" 45	9	0	18	0	27	0	36	0
" 48	8	0	16	0	24	0	32	0
" 50	7	10	15	0	22	10	30	0
By paying	6s. a yr.		12s. a yr.		18s. a yr.		24s. a yr.	

and in the same proportion up to a maximum insurance of £200.

The management of the Fund has been vested in the hands of the Admiral Superintendent of Naval Reserves, a Captain Royal Navy, and the Assistant-Secretary of the Admiralty, as trustees ; and an honorary secretary, with an assistant who is paid a salary of £25 per annum.

After a career of five years the balance sheet for the year ending December 31st, 1882, showed a capital of £5000, invested in approved securities ; a balance of £508 at the Bank ; that the members insured numbered 2759, and that the income from subscriptions alone during the twelve months was £1954.

I admit that this Fund has been worked under unusually favourable circumstances by virtually gratuitous management ; it has had no advertising, office or agency expenses ; but the rates of premium were settled by actuarial calculation, and will serve to furnish an idea to fishermen, and to those who may desire to promote their welfare, of the sum required to insure a given payment at death ; and the fishermen can go to any coastguard station and learn from the men there whether they feel any inconvenience from the payment of their premiums.

I should add that membership of the Coastguard Life Insurance Fund is entirely voluntary, no one having any pecuniary interest in inducing the men to join.

The benefit to be derived from the Post-Office Savings Bank is a subject worthy of the attention of provident fishermen ; so small a sum as one shilling can be deposited.

There are few men who have not at times a spare shilling in their pocket, and though it may seem a sum scarcely worth saving, a little self-denial in times of plenty will bring abundant reward when fish are scarce and earnings consequently small.

STATISTICAL INFORMATION.

DISTRICTS.	Number of Fishing Vessels.	Number of Men and Boys engaged in Fishing.	Tons Weight of Fish captured per Annum.	Casualties to Fishing Vessels.			Loss of Life by Fishermen in pursuit of their Calling.			Tons Weight of Fish captured in one Year for each Fisherman's Life Lost.	Tons Weight of Fish captured per Man in a Year.
				Number which occurred during Two Years.	Average Number per Year.	Rate per 1000 Boats per Annum.	Number of Lives lost during Two Years.	Average Number of Lives Lost per Year.	Rate of per 1000 Men per Year.		
Hull	3,598	13,250	138,269	73	36.5	10.15	254	127.0	9.58	1,089	10.4355
Harwich	2,676	14,100	114,927	53	26.5	10.00	319	159.5	11.31	720	8.1508
Newhaven	1,371	3,350	9,673	10	5.0	3.65	5	2.5	0.75	3,869	2.8874
Weymouth	3,305	7,300	97,861	126	63.0	19.06	33	16.5	2.26	5,931	13.4056
Liverpool	1,166	3,300	11,538	14	7.0	6.00	13	6.5	1.97	1,775	3.4963
Total for England	12,116	41,300	372,268	276	138	11.39	624	312.0	7.55	1,193	9.0137
Scotland	15,049	48,100	216,818	356	178	11.83	173	86.5	1.8	2,506	4.5076
Ireland	5,513	19,800	25,949	467	233.5	42.35	60	30.0	1.5	865	1.3105
Totals for United Kingdom, excluding Isle of Man and Channel Islands	32,678	109,200	615,035	1,099	549.5	16.81	857	428.5	3.9	1,435	5.6322

II.

THE sea-fishing industry of the United Kingdom may be classified in four great divisions, which are Trawling, Drifting, Great Line Fishing, and Seining.

Trawling is the method resorted to for the capture of the various descriptions of fish which frequent the lower depths of the sea, such as soles, plaice, turbot, dorey, haddock, cod, &c.

Drifting is employed for the capture of the fish which exist near the surface or in the middle depths of the ocean ; these are herring, mackerel, and pilchard.

The great line is used for the capture of fish near the bottom.

The seine is the net used to surround fish in shallow waters near the land.

There are various other methods of fishing, but their importance and extent are not to be compared with the systems above alluded to ; an account of them would occupy much space, and would take me beyond the scope of the subjects dealt with in this paper.

The apparatus known as the trawl is a funnel-shaped net, of which the mouth is the widest part, and whence it gradually diminishes in size until it comes almost to a point.

The upper edge of the mouth of the net is secured to a wooden beam, which rests at each end on an iron shoe or runner called *the "trawl head."*

The lower edge of the mouth is secured to a rope, called the "ground rope," which is made fast to each end of the "beam," and hangs in what is technically known amongst seamen as a "bight" between the "trawl irons."

Another rope is made fast to the two ends of the beam, so as to form a span, and to the centre of this span is bent one end of the "drag rope," the other end of which is secured on board the vessel. When the trawl is lowered in the water for working, the "beam" is supported in a horizontal position by the "trawl heads," whilst the "ground rope" rests on the bed of the sea, thus forming a wide mouth.

This apparatus is dragged along the bottom of the sea by the action of the tide and wind on the vessel, and every movable object with which it comes in contact is swept into the recesses of the net, where it is retained until the trawl is hauled up and its contents upset on to the deck of the trawler.

The vessels employed in trawling are generally fore-and-aft rigged, and vary in size from the smack of eighty or ninety tons, with a crew of eight or nine men and boys, costing, with its stores, gear, &c., from £1500 to £1700, down to the small half-decked or open boats engaged in shrimp trawling, and owned by the crew, consisting of one man.

Of late years steam-tugs have to some extent been employed as trawlers in the North Sea; these vessels have the advantage of being independent of wind and tide; their use has not, however, been rapidly extended.

The steam-trawlers do not generally engage in the more distant fisheries, but, as a rule, confine their operations to the suitable grounds within a distance of twenty or *thirty miles* from the shore.

The larger class of trawlers sailing from the ports in the North Sea engage in very protracted cruises, remaining at sea for six, eight, ten, or even twelve weeks at a time, and extending their operations from the island of Texel to Heligoland, and even to the northward of the Horn Reef, off the coast of Jutland. This great trawling-ground of the North Sea is at such a distance from any English ports, that were the trawlers to bring their own catches into harbour, the fishing could not be remunerative, as a considerable portion of the fish would have so deteriorated by the time it reached the markets as to be no longer saleable, and the period occupied in going to and from the ground would be greater than that spent in fishing.

It was to meet this drawback that the trawlers were organized into fleets or companies, and the co-operation of the "carriers" introduced. Many of the carriers run direct from the trawling fleets to Billingsgate Market, and the fish are thus brought within reach of the consumers without undergoing the risks and delays attaching to frequent transshipments.

In the winter, many of the North Sea trawlers work on the Dogger Bank and nearer grounds independently of the fleets, and bring their own catches into port from day to day.

The ground known as the "Silver Pits" is one of the most frequented at this season. The depth of water here is from 35 to 45 fathoms, which is considerably deeper than the average of the North Sea. This depression is situated just to the southward of the Dogger Bank, and, commencing at a point about 50 miles E.S.E. of Flamborough Head, it extends in an east-south-easterly direction for about 60 miles, with an average breadth of 8 miles.

During the winter nearly all kinds of fish resort to this

deeper water, probably because it is less affected by variations of temperature than the surrounding shallower sea.

It is a remarkable fact that whilst in mild seasons the greater abundance of fish in the Silver Pits, as compared with the neighbouring banks, is not so very marked, in winters of more than usual severity very large catches are invariably obtained there, and this is especially the case with regard to soles, which are then found there larger and of better quality than elsewhere.

In the English Channel the principal trawling ports are Brixham and Plymouth. The vessels are, as a rule, cutter-rigged, and range from 60 tons downwards.

The English Channel trawling-grounds are more restricted in their area, and are at a less distance from the coast than those of the North Sea, so that the vessels are enabled to run into port daily to land their fish.

Brixham, and Barking on the Thames, were the birth-places of the trawling system ; it was not until 1835 that trawling was commenced at Ramsgate, whilst Hull was the first port in the North Sea to adopt this method of fishing.

Grimsby commenced its career as a trawling port in 1858, and has now become the most important on our coasts, between 600 and 700 trawlers at present belonging to that port, whilst their numbers are being added to yearly.

In the estuary of the Thames and Medway a large number of a smaller class of trawlers find employment, many being engaged in the capture of shrimps for the London markets.

Trawling is but very little employed off the Scotch coasts, the deeper waters and rocky nature of the bottom of the surrounding seas not being suited to the industry.

Off some of the Irish ports trawling is to a certain extent

practised, but the suitable grounds are restricted in area ; there is no immediate market for the fish, and off the West Coast the tremendous Atlantic waves act as a great drawback to its development.

As a food-producing industry, the quantity of fish captured by trawlers in one year may be estimated :—

By English Trawlers	..	..	..	211,707 tons.
„ Scotch	„	..	..	762 „
„ Irish	„	..	..	2,688 „
Total	..	..	..	215,157 „

The price obtained for trawled fish in Billingsgate Market averages about £12 per ton ; the total earnings of our trawling fleet in one year will therefore amount to over £2,581,000.

As an instance of the extent to which capital is invested in this industry, one firm possesses a fleet of about 200 vessels, of which from 140 to 150 are constantly kept employed on the fishing grounds ; whilst the others are in harbour to give leave to the crews, and to refit, or are proceeding to or from the fishing grounds.

Five or six steamers are engaged in carrying the fish direct from the fishing fleet to Billingsgate.

In 1881 these steamers made 286 trips, and landed at Billingsgate 376,426 packages, containing on an average ninety pounds weight of fish, equal in all to over 15,000 tons, which realised, when sold at the market, £182,772, a rate of 9s. 8d. per package.

The fish caught by trawlers in the English Channel are principally landed at Brixham and Plymouth, where they are packed in baskets (called “ pads ”) which contain about twenty-five pounds weight each, and are sold by auction to the buyers or wholesale dealers in fish.

The crews of the trawlers engaged in the North Sea are fed by the owners, and receive a certain rate of pay weekly, in addition to which they are paid a percentage of the amount realised by the sale of all fish caught.

The system of payment in the Channel trawlers is somewhat different, being entirely by shares, viz. :—

Owner	..	..	..	3½ shares.
Master	..	..	..	1½ „
Two men	..	..	..	1 share each.
Total	..	..	..	7

The boys, being apprentices, do not share.

I have been informed that in some fishing-vessels in the North Sea it is the practice, when caught in a gale and unable to make for a port, to put the vessel under small canvas, and lash the helm. The whole of the crew then go below, haul over the companion hatch, and remain down till the weather moderates, leaving the vessel to ride out the storm as best she can.

I have found it very difficult to give credence to this statement; not that I have any doubt as to the truthfulness of my informant, but that I can hardly realise that it would be possible to find a body of men in any vessels so criminally careless, not only of their own lives, but of those of their fellow-beings who might be in other vessels in the vicinity.

If this habit prevails, it might at any moment lead to a disaster of great magnitude, the responsibility of which would attach to each individual member of the reckless crew.

The drift-net fishery, although it is confined to the pursuit of the herring, mackrel, and pilchard, is of the very highest importance.

The drift-net itself is composed of pieces of net measuring 30 fathoms in length by about 30 feet in depth. These are secured along their upper side to a "warp," and are joined to one another at the ends. In a large boat the whole length of the net will be about two miles. When in use it is suspended at any required depth by floats, which keep it in a vertical position. It thus forms a long wall in the water, and any fish which strike against it become enmeshed.

The fishing-boat rides by one end of the net, which drifts with the tide or wind.

Nets of different diameter of mesh are used for each description of fish, the measurement, taken from knot to knot along the line, being usually for mackerel $1\frac{1}{2}$ in., or 30 meshes to the yard ; for herring, 1 in., or 36 meshes to the yard ; and for pilchards, $\frac{3}{4}$ in., or 45 meshes to the yard.

Except at Yarmouth, drift fishing-boats rarely exceed 30 tons in measurement. As a rule, they are half decked, usually lugger-rigged, the majority using the dipping lug.

The size of the drift boats has been steadily increasing during the last fifty years, as it has been found necessary to go farther and farther from the land in pursuit of the fish, until it is now not at all unusual for the fishing to be carried on at a distance of fifty miles from the port.

Scotland is the great home of the drift fishery for herring, employing, in the year 1881, 8279 boats manned by 43,837 fishermen and boys afloat ; whilst on shore 2499 coopers, 18,854 gutters and packers, and 2233 labourers, were engaged in the various operations connected with the curing of the fish.

In that year the labours of these 67,423 persons resulted in the cure of 1,111,155 $\frac{1}{4}$ barrels of herrings.

The number of cured herrings in a barrel varies from

700 to 1000 ; the average, allowing for waste in the process of curing, may be taken at 850 ; which will give a total number of 944,481,962 fish, representing a weight of about 166,673 tons.

In the course of the year 1881 there were exported from Scotland 745,879 $\frac{1}{4}$ barrels of cured herrings. Germany took 632,143 barrels ; Russia, 78,624 $\frac{1}{4}$ barrels ; Ireland, 33,459 $\frac{1}{4}$ barrels ; Holland, 561 $\frac{1}{4}$ barrels ; other places in Europe, 119 $\frac{1}{4}$ barrels ; and places out of Europe, 972 $\frac{1}{4}$ barrels.

In Scotland the herrings are cured under the supervision of officials of the Board of British White Herring Fishery, who brand the barrels with a certain mark which is accepted in the markets as a guarantee of the quality of the contents.

Nearly all the branded herrings are sent abroad, where they command a higher price than is paid for unbranded fish.

In the earlier years of the present century it was considered advisable to stimulate the herring fisheries by the institution of a system of bounties ; these were 2s. a barrel on herrings cured gutted, and 2s. 8d. in addition on each barrel of herrings exported, whether gutted or ungutted. These bounties ceased on June 1st, 1815, and were replaced by a bounty on herrings cured gutted of 4s. per barrel, which continued for over eleven years to April 5th, 1826. In the four succeeding years the bounty was reduced 1s. per barrel each year, until April 5th, 1830, when it ceased altogether, and has not since been renewed.

It was owing to these bounties that the system of branding originated ; and in Scotland the curers were so much benefited by the higher price commanded by

herrings thus distinguished that it has been continued, and is growing in favour, although since 1858 a fee has been imposed of 4*d.* for each barrel, and 2*d.* for each half-barrel marked.

In the year 1881, 494,182 $\frac{1}{4}$ barrels of herrings were branded, the fees for which amounted to £8236 7*s.* 6*d.* I have extracted the foregoing remarks on the Scotch herring fisheries from the reports of the Commissioners of the Fishery Board, Scotland, for the year ending December 31st, 1881.

The greater proportion of the herrings captured off the Scotch coasts are cured, but at places where facilities exist for transporting the fish by rail to our great centres of population considerable quantities are sold in a fresh condition. These do not appear in the returns of the Scotch Fishery Board ; but, from the information I have obtained from the coasts, I estimate that about 30,000 tons are disposed of in this way, making a total of nearly 200,000 tons of herrings captured off the coasts of Scotland in one year, representing a money value of some £1,900,000 sterling, even supposing that they realised only £9 10*s.* per ton.

The herring fishery, however, is not confined to Scotland ; it is prosecuted around almost the whole coast of the United Kingdom.

Yarmouth has a fleet of vessels of very large size, engaged in the drift fishery for herring.

The majority of the herrings captured off the coast of Norfolk are cured in the form of bloaters, with which we are familiar at our breakfast tables. There is also a considerable herring fishery carried on, on the coasts of Devon and Cornwall ; most of these are sold in a fresh condition.

If the herring fishery were prosecuted off the Irish coasts, it is probable that it would be very remunerative to those engaged in it ; but as the fish could not be brought to market whilst fresh, curing stations would have to be established, and the fish prepared for the foreign markets.

The quantity of herrings taken in a year by British fishing-vessels probably approaches some 300,000 tons, at an average of 5,500 to a ton weight ; this represents in round numbers 1,650,000,000 fish.

In the North Sea about 480 Dutch vessels, of an average size of 40 tons each, are annually engaged in the herring fishery, from May to July, in the neighbourhood of the Shetland Isles. They salt the fish daily as they are caught, and send them to Holland as opportunities offer by the carrier vessels which attend upon the fishing fleets.

These Dutch drifters continue at sea for long periods together, occasionally putting into some of the harbours in the Shetland Isles when in want of fresh provisions. Lerwick and Levenwick are their favourite rendezvous. The crews are not averse from barter, offering tobacco and spirits in lieu of money in payment for their purchases. They sometimes endeavour, not always without success, to obtain herrings from the British fishing-boats on these terms.

I compute that this fleet of Dutch boats fishing on the same grounds as our own men, must capture at least 180,000,000 to 200,000,000 herrings annually.

In Norway, I believe, the annual take of herrings is as great as, if not greater than, that of Scotland. France also has a large number of vessels employed in the pursuit of this fish.

The mackerel drift-net fishery is carried on principally off the south coast of Ireland, Kinsale being the headquarters of this industry.

During the season some 600 boats are engaged in this fishery ; they return to port every morning with their fish, which are packed in boxes with ice, and sent by fast steamers to Milford Haven, whence they are distributed by rail to the various markets in England. The boats resort to Kinsale from other Irish ports, but principally from the Isle of Man.

England and Scotland also send their contingents of boats to engage in this fishery, which lasts from March to July, when the boats leave for the Irish Sea.

Large shoals of mackerel also frequent other parts of our coasts, and afford remunerative occupation to the fishermen in the localities which they visit.

The mackerel caught in the vicinity of the British Isles, in one year, may be estimated to weigh about 15,000 tons, which at £12 a ton represents a money value of £180,000.

Mackerel congregate in shoals, which in the summer months approach the land ; when in pursuit of their food these shoals rise to the surface, and become visible to observers in their vicinity.

The fish are so closely packed that the colour of the water is changed. At a distance the shoal will appear as a dark shadow on the bright blue of the sea ; as it approaches it will be seen to scintillate and sparkle, as though it contained myriads of diamonds. This appearance is caused by the leaping of the fish from the water—the prey in their endeavour to escape from their pursuers, and the mackerel in their rushes to secure their victims.

The drift-net fishery for pilchards is confined to the coasts of Cornwall and Devon. The fishing villages on the

shores of Mount's Bay owe much of their prosperity to this industry.

A great proportion of the pilchards taken are cured in bulk, after which they are packed in casks and sent to the Spanish and Italian markets. Penzance is the headquarters of this trade, most of the fish being shipped from there.

At many places the type of boats in use by the drift fishermen is considered to be very defective; the hull is often of bad design, and the rig unhandy.

These defects are held to lead to frequent loss of life and property at sea, and many suggestions have been made for improvements, which the fishermen have been slow to adopt.

Of all the different builds of drift boats which I have seen, the Mount's Bay boats have appeared to me the best fitted to cope with bad weather, and to ride out a heavy sea. I believe that their superiority has been amply proved on many occasions, when overtaken by heavy weather at sea, in company with boats from other parts of the coast.

A boat of this class once made the voyage from Mount's Bay, round the Cape of Good Hope to Australia, and arrived at its destination in safety; there could be no greater proof than this of the good qualities of the boat, or of the adventurous spirit of our fishermen.

I found, when I visited the Isle of Man, that the fishermen there had, to a great extent, discarded their own type of boat in favour of the Mount's Bay build and rig, and that the change had proved most satisfactory.

Any improvement in the sea-going qualities of their boats must be very much to the advantage of the fishermen, and is a subject worthy of careful study.

Next in importance to the trawling and drift-net fisheries come the great and long-line fishing, the total produce of which is over 51,000 tons weight of fish per annum.

In these methods of fishing, stout lines are employed, to which are attached at intervals, short lengths (called snoods) of smaller lines, each of which has a hook at its free end.

The favourite baits are mussels and whelks, or, if these are not procurable, pieces of fish, generally herrings.

The baiting of a great line, with its thousands of hooks, is an operation which occupies a considerable amount of time, and much care is necessary, in coiling it into the baskets, to arrange the hooks in such a manner that each shall run out clear in its turn, without entangling itself with those which are to follow.

The laying-out of the line after it has been baited is a somewhat lengthy business, the boat having to be kept moving in a given direction across the tide; whilst the line is slowly going overboard and sinking to the bottom, where it offers an array of tempting morsels to any passing hungry fish.

The end of the line first dropped overboard is attached to an anchor and a buoy-rope, to retain it in place and mark its position.

As soon as the whole length of line has been got rid of, the fishing-boat returns to the buoy, and the men commence to haul in their line—a most laborious process.

Fish caught in this manner command a higher price in the markets than do those taken in the trawl.

The explanation of this is that line fish are taken from the water alive and uninjured, whilst fish captured in the trawls are sometimes dead or bruised before they are removed from the net.

The deep-water line fisheries are engaged in by smacks of from forty to sixty tons measurement, the crew numbering thirteen ; many of these vessels carry as much as seven miles of line.

These smacks are fitted with wells, in which the fish are kept alive for considerable periods, until the return of the vessel from her cruise which, as a rule, extends over six weeks.

British line-fishing vessels, principally from Grimsby, Shetland, and Orkney, resort to the deep-sea cod and ling banks off Iceland and the Faroe Islands in the month of March, and continue the season there until October.

These vessels remain on the grounds until they are filled up with fish, when they return to port with their cargo. Some of the fish taken are cured on board ; others, principally cod, are put into the well and brought home as what is termed in the market "live cod."

Although these fish are known in the market as "live cod," they are killed by a blow on the head with a mallet when they are taken from the well of the fishing-smacks, and consequently they never actually reach the market alive.

Fish which are killed in this way continue moist, and do not become rigid, whilst fish allowed to die after removal from the water very quickly become dry and stiff.

The difference is particularly noticeable in crimped cod, the killed fish retaining a much better appearance than the one which has been left to die.

Line fishing is pursued with success on the south coasts of England, producing about 12,400 tons of fish annually.

In Ireland it is also followed, but as a rule small open boats, manned by three or four men, are employed ; these boats cannot venture to any distance from land, and in

consequence the deep-sea fisheries are left entirely undisturbed.

The seine net is much used on the south coasts of England in the bays where suitable beaches are found on which to draw it. Between Dover and the Land's End about 10,600 tons of fish are annually captured in this way.

It is most extensively used on the Cornish coast for the capture of pilchards, the seine for which purpose is 160 to 200 fathoms long, 15 fathoms deep, with corks along its upper edge, and leads along the lower to keep it in a vertical position in the water, and is worked by three boats manned by a total of eighteen men and boys: the seine boat and the follower, with seven men each, to surround the shoal; and the lurker containing the master, who directs the operations, with one other man and two boys.

During the pilchard season, watchers, termed "huers," are stationed on high ground overlooking the sea, for the purpose of observing the approach of any shoals of pilchards, which event they immediately make known by signals.

The large rowing boat, in which the seine is kept ready for use, is then manned, and proceeds in the direction of the shoal, its course being directed by signals from the watchers on the hills.

On reaching the shoal, the fishermen endeavour to shoot the net completely around it; and if the attempt to surround the shoal has been successful, the seine is gradually towed into shallow water, where the fish are dipped out into boats specially constructed for the purpose; from these boats they are transferred to the curing-house.

In a successful shot of the seine, I believe it is not at all unusual to secure 2000 hogsheads, equal to about 6,000,000 pilchards. Such an occurrence is the signal for

the most intense excitement amongst the inhabitants of the village ; men, women, and children join in the various labours of securing, curing, and packing the fish.

Profitable as this fishery sometimes is, it is essentially speculative in its nature ; season after season may pass without an opportunity of securing a shoal offering itself ; either the fish do not approach the coast in the locality of the scine, or when they are seen the weather is so boisterous as to prevent the boats from attempting their capture.

Our lobster and crab fisheries have been the subject of especial legislation.

The supply of these crustacea had been perceptibly decreasing for some years ; the fishermen complained that they could no longer earn a livelihood from their pursuit. In 1878 a Commission of Inquiry was appointed in consequence, and the principal recommendations contained in their report were subsequently embodied in an Act of Parliament for the regulation of these fisheries.

Since this Act has been in force, crabs and lobsters have shown a tendency to increase in numbers and in size. Should this improvement continue, as it seems likely to do, we may hope in future years for a very largely increased production of these shellfish ; although it seems probable that the demand will always continue to be in excess of the supply, thus enabling a market value to be attached to them which places them in the category of luxuries, rather than in that of the food of the nation.

The older fishermen, who are no longer enabled to endure the exposure and fatigue inseparable from service in the deep-sea fishing-boats, no matter of what class, frequently engage in the longshore fishing for crabs and lobsters, and are thus enabled to earn their living in a manner congenial to their earlier habits.

I have found it very difficult to obtain any estimate of the quantities taken at any point off our coasts, as the lobster smacks usually buy them direct from the boats, for conveyance to the ponds at the Hamble River and the great markets.

Considerable numbers of lobsters are now imported from Norway ; they are smaller than the average of English lobsters, but are esteemed to have a finer flavour than the latter.

The rocky shores of the west coast of Ireland are very favourite haunts of the crab and of the lobster, although they are but little fished for, especially the former, which is hardly ever eaten by the Irish.

Our oyster fisheries have for many years engaged public attention. Scheme after scheme has been proposed for increasing the supply of this bivalve ; organisations have been formed with the same object ; the subject has been discussed and considered, from various points of view, in the public prints and in other ways ; but up to the present little practical benefit has resulted.

Our native oysters are amongst the most expensive of our luxuries, commanding prices which place them out of the reach of most people ; and these high prices are maintained in the face of a considerable development, of late years, of a trade in oysters imported from Holland and from the United States of North America.

Where there are natural beds of oysters there are, as a rule, ancient rights of dredging, which the possessors are very disinclined to see interfered with in any way.

To a creature of the sedentary habit of the oyster, constant dredging means literal extermination so far as regards the area over which the operation is conducted.

The spawn of the oyster, usually termed "spat," is

infinitesimally small, and when shed has a milky appearance in the water, in which it swims about freely until it comes in contact with some hard substance, as a stone or an old shell, to which it can adhere. If it fails to find such a substance within a few days of the time of its emission from the parent oyster, it perishes.

Once fixed to a stone or a shell, or any other similar substance, its whole life is passed at that spot.

Having no power of locomotion, the oysters in a bed may be so reduced in numbers by dredging that it would be a matter of some years before the stock would be replenished, as an oyster does not arrive at its prime in less than four years.

In localities which appear suitable for the cultivation of the oyster, experiments on a small scale might be made by individuals, who should study very carefully the effects of the variations of wind, sea, temperature, and climate upon the young colonies, and record and tabulate the result of their observations.

If one experiment fails, the cause should be sought, and another attempt made to win the crown of success; measures being taken to avoid the dangers which wrecked the previous venture.

It is only by organised effort and careful experiment and observation that the deficiencies of our own oyster beds can be made good, and this portion of our fishing industries placed on a satisfactory footing; but this experiment must be made by individuals personally interested in its success, and capable of observing cause and effect.

So far back as the time of the Roman occupation of Britain, the estuary of the Thames was famed for its oysters, and at the present day it maintains its supremacy. Whitstable is the headquarters of the Thames oyster

fishery, and its inhabitants largely depend on this industry for their livelihood.

The vicissitudes of the oyster fishery in the estuary of the Severn during the last twenty years will serve to illustrate the precarious nature of the pursuit, and the manner in which beds of oysters may be exterminated.

The boats employed average from eight to twelve tons, are cutter-rigged, manned by three men each, are good sea boats, and are locally termed "skiffs."

The most prolific season on record was that of 1862-3, in the thirty-nine weeks of which 24,000,000 oysters were taken by about seventy skiffs. The value of the season's take amounted to about £16,450, giving an average of £235 to each skiff.

The remarkable success of the season, 1862-3, gave a great impetus to the fishery, so that in the year 1868-9 the number of skiffs working had increased to about 200, but only about 17,000,000 oysters were taken—a decrease of 7,000,000 as compared with 1862-3.

The price of oysters had in the meantime risen to such an extent, that the oysters realised somewhere about £43,800. They had more than trebled in price in six years.

From 1868-9 the takes of oysters diminished year by year, and the skiffs were gradually withdrawn from the industry, until in the season 1880-1 the employment of seventy-five skiffs only resulted in a take of 3,250,000 oysters.

In the season 1881-2 there were only 66 skiffs employed; the take of oysters fell to about 2,500,000.

The labours of our fishermen succeed in providing for the population of these islands a supply of fish food amounting to about 615,000 tons weight per annum, which at £12 per ton represents a money value of £7,380,000.

Vast as this quantity appears, it does not suffice to meet the demand, and the imports of fish into the United Kingdom in the year ending December 31st, 1881, according to the Custom House returns, were valued at £1,828,124; against this sum we must set off an export value of £1,626,085, which will leave an excess of imports over exports of £202,039

The larger portion of the fish captured is sent to our great cities and towns for consumption whilst fresh. In the course of last year, the quantity of fish brought to Billingsgate by land was 76,578 tons, whilst the sea-borne fish amounted to 42,399 tons; a total of 118,977 tons thus passed through this great market in twelve months.

In addition it is estimated that some 24,000 tons of fish are delivered in London annually without passing through Billingsgate.

This makes the total quantity of fish brought to London in a year nearly 143,000 tons, or almost one-fourth of the total capture on our coasts, and represents a consumption of nearly 67 lbs. per head of the population; this is probably about equal to the consumption of beef in the Metropolis.

It speaks well for the system of carriage, that only about 400 tons of fish were condemned at Billingsgate in the year 1881 as unfit for food, and a large proportion of that was shell-fish.

On many parts of our coasts, the want of convenient and accessible harbours is a great hindrance to the successful prosecution of the fisheries, and a fruitful source of danger to our fishermen.

Many fishing villages have no harbour accommodation of any sort. The boats are launched from the beach, and

on their return have to be hauled up out of reach of the sea at high water.

The return of the boats to these places is often impossible, and necessitates their making for some distant harbour, when caught in bad weather at sea.

Disasters to fishing-boats attempting to take shelter in harbours, the pilotage of which is imperfectly known to the crews, frequently arise from this cause.

At some places attempts have been made by fishermen to lessen the dangers of taking the beach in bad weather on a lee shore.

A very interesting experiment has been made at Hallsands and Beesands, two fishing villages on the coast of Devonshire, at which the boats have to take the beach. At these places, dogs of the Labrador breed are employed to assist in bringing the boats to land, at such times as it would be dangerous for the crew of the boat to attempt the operation unaided.

The dogs have been trained to swim off through the surf to the boats, which have previously been brought, stern first, as close to the shore as is prudent.

On arriving at the boat, a small piece of wood, to which a line is attached, is given to the dog, which then returns to the shore dragging the line after it.

As soon as the dog reaches the shore, the crew of the boat attach a rope to the line, which is then hauled on shore by the men on the beach.

This rope, which is secured to the boat through a hole in the after end of the keel, is then manned by the men on shore, who watch for an opportunity of a momentarily smooth sea, on the occurrence of which they quickly run her up high and dry on the beach.

No one can help admiring the courage, obedience, and

intelligence of the dogs employed in this service, and they deserve the kindness and gratitude of the men whom they serve so faithfully.

That our fishermen should have to resort to such means to secure their safe return to shore is a certain proof of the difficulty of finding harbour accommodation for their boats.

On the east coasts of England and Scotland this want is greater than elsewhere.

The importance to the fishing industry of increased harbour accommodation on our east coasts cannot be too strongly dwelt upon. This accommodation would not only be of great value for fishery purposes, but it would afford shelter and security to many ships and vessels engaged in the navigation of the North Sea and coasting trade.

There is at present no port which can be safely approached in bad weather on the east coast between the Thames and the Humber.

Then with regard to the mitigation of the dangers of the fisherman's life.

I believe that when engaged in "ferrying," the men object to wearing cork life-belts, as these are such a great impediment to free motion. They render stooping a matter of difficulty, whilst great agility is required in picking up the fish-boxes and passing them on board the "carrier," as the boat rises on a sea. Any one familiar with the movements of boats and vessels in a seaway will be aware that the operation must be performed in a second, and that a man encumbered with a life-belt of the present form, admirable as it is for certain purposes, would labour under great disadvantages.

I think the inventive talents of the nation might succeed in producing a form of life-belt which would not be open to

these objections. It should be soft and pliable, so as to adapt itself to the figure of the wearer. Its principal flotation power should be high upon the chest and back. It should be so designed as not to impede the action of the muscles brought into play when the arms are used to lift a considerable weight and raise it above the level of the eyes whilst the body is liable to be swayed by the oscillations of a boat in a seaway.

But very slight additional buoyancy is needed to support a man in the water, even when he cannot swim, or is disabled.

The fisheries on the coast of Ireland offer a wide field of enterprise, and their development would tend to promote the welfare of the Irish people.

Already the English, Manx, and Scotch boats which prosecute the mackerel fisheries have commenced to find their way to the west coast of Ireland, where they have obtained remunerative returns for their labours.

Within the last three years, Dingle Bay has become a considerable rendezvous of the mackerel drift boats for the early season's fishing; the experiment was first tried in 1881, and was so successful that increasing numbers of boats have resorted there in the two following years, making it their headquarters for the prosecution of the deep-sea drift fishery, and sending their fish by steamer to the English markets.

The necessities of the crews of these boats must undoubtedly give a considerable stimulus to local traffic, and contribute towards the prosperity of the surrounding district; but I hope this will not be the only result. I look for the gradual extension of an organised system of fisheries up and down the whole west coast of Ireland, which is singularly favoured in the possession of numerous

natural harbours most suitable for fishing ports, if the inhabitants of those coasts were to realise that the sea will yield them a far more abundant harvest than their rocky and barren soil will give—a harvest practically inexhaustible, always ripe and ready for the sickle.

I am informed that, as a result of the spirit of enterprise aroused amongst the natives, on seeing the fishermen from other localities taking large quantities of mackerel in the neighbourhood of Dingle, in the four months from 1st of January to 30th of April, 1882, the number of canoes registered as fishing-boats rose from 44 to 75, and the number of fishermen from 147 to 225, an increase of 70 per cent. in boats, and 53 per cent. in men.

In the summer months large shoals of mackerel visit the bays and creeks in Ireland, offering to the cottiers the means of furnishing themselves in abundance with a supply of most nutritious food.

Too often these opportunities are lost, and the mackerel, after days (which may perhaps extend to weeks) spent close to the shore, retreat undisturbed to the open sea, where their food will continue in abundance ; whilst the human beings who have been watching their movements have to face the prospects of a winter of privation and suffering—evils which might have been averted had advantage been taken of the presence, almost at their very doors, of these shoals of fish.

The difficulty of obtaining a market is supposed to render fishing on the west coast of Ireland unremunerative ; but it is found remunerative to forward mackerel and lobsters from Norway by sea to Hull, and thence by rail to London ; and the mackerel and lobsters from the west coast of Ireland could, even with the present means of transit, be forwarded to London, or any of the great English

markets, in less time than is occupied in the voyage across the North Sea from Norway to Hull.

There are now four points at which the west coast of Ireland is connected by rail with the main routes of communication between the two islands ; these are Sligo, Westport, Galway, and Bantry.

Galway and Bantry have great natural facilities for carrying on a fish traffic.

The fish caught off the coasts might be collected by steamers and brought to these places, whence they could be dispatched to any part of the kingdom.

To give an idea of how the development of these Irish fisheries might with ease be conducted, it is a fact that in 1880, the year of the distress in Ireland, a Canadian committee distributed in one district nets to the value of £200 ; in the following year the people to whom they were given realised £1200 worth of mackerel.

This is, I think, a remarkable proof of the benefits which might accrue to the inhabitants of the Atlantic seaboard of Ireland, if they could be induced to adopt fishing as a means of livelihood, instead of only pursuing it in an intermittent fashion.

To follow the fisheries with success on these coasts, well-found vessels of considerable size would be necessary to contend with the Atlantic seas. The Yarmouth " Busses " used for the herring drift-net fishery run from fifty to eighty tons. The French luggers engaged in the mackerel fishery are as large. To ensure as far as possible the safety of the crews, it would be necessary to adopt vessels of somewhat similar type. But unless the inhabitants of the coast can be induced to enter earnestly and heartily into the pursuit, and to follow it with steadiness and perseverance, the best boats and appliances known will not make their

fishing successful, and it will probably be their lot to see the fishermen from other localities deriving the greatest benefits from these fisheries.

With regard to the idea prevailing that the supply of fish is diminishing, and that this is due to over-fishing, it must be borne in mind that most species of fish prey on others, and that the impartial depredations of man do not disturb the balance of nature on which depends the power of reproduction of each species.

It is also said that fish must be decreasing, as it becomes necessary each season for the fishermen to seek them in deeper waters and at greater distances from land; and from nowhere have I heard stronger and louder complaints on this score than from the west coast of Ireland.

No one can suppose that the waters of that locality have been overfished, or that by any operations of man the stock of fish in those waters has been reduced.

The movements of fish are very difficult to account for; they appear in and disappear from localities for no obvious reason.

It may be that sea fish have found that, in the shallower waters near the land, they are exposed to the attacks of an enemy which they hope to avoid by seeking the greater depths of the ocean.

Instead of looking upon any improvement of the means of capture as tending to exterminate the species, I am rather disposed to welcome it as the possible producer of an increased supply of fish, for the benefit of our teeming population.

Any research into the laws which govern the life, habits and movements of fish, presents great difficulties, owing to the vastness of the subject, the limited power of man to explore the recesses of the ocean, the freedom of its

inhabitants to roam whithersoever they please, and the never-ceasing tides and currents which, together with the variable action of the winds, keep the seas in such constant and uncertain motion.

The Government of the United States has set the example of devoting a sum annually to the breeding of sea fishes ; it is probable that the scientific research necessary to ensure the success of this undertaking will furnish us with a knowledge, not only of the method of spawning of sea fishes and of their powers of reproduction, but also of their habits and movements.

It is difficult to over-estimate the economical and commercial value of accurate information on these points ; we may hope, in time, to learn from them how to stimulate the production, should it ever become necessary to do so, and how to improve the methods of capture so as to ensure the smallest percentage of destruction of the young and immature of the species. Such knowledge, and its application, might tend to a very large increase in the supply of fish of various kinds.

The example of the United States is well worthy of imitation by the European nations which have large stakes in the fisheries ; from their relative position to one another, joint action is almost a necessity, as all would equally share in the material and scientific benefits which might accrue from researches made in this direction.

I therefore hope sincerely that the present International Exhibition may do much to bring about this unity of action.

THE DUKE OF ROXBURGHE proposed a vote of thanks to H.R.H. the Duke of Edinburgh for the paper and to H.R.H. the Prince of Wales for reading it. He felt that

no words of his were required to commend this resolution after the very exhaustive and interesting paper which they had all listened to with so much pleasure. It appeared to him to be doubly valuable, first, because it contained facts and not theories—facts collected by H.R.H. the Duke of Edinburgh when in command of the Naval Reserve and the Coast Guard, with great trouble, and which spoke for themselves; and secondly, speaking as a Scotchman, and being intimately connected with Scotch fishermen, he might be allowed to say, that if anything were required to strengthen their attachment to the Royal Family, the fact that His Royal Highness had written this paper—the first to be read at these Conferences—and that it had been read by the Prince of Wales, would supply it. He begged therefore, to move the resolution he had mentioned.

THE DUKE OF NORTHUMBERLAND said he need not occupy much time in seconding this motion, but he was sure all present would agree with him in admiring alike the extensive knowledge of the subject which the paper disclosed, and the wise suggestions which it offered for the improvement and benefit of the class to which it referred whilst they must have been still more struck with the sympathy which it expressed with the wants, and sorrows and sufferings of that class. He must also, as President of the Royal National Lifeboat Institution, bear witness to the great interest which His Royal Highness showed in that most important organisation. In conclusion, he must say that all those who had listened to the paper must have felt that it derived an additional weight from being read by His Royal Highness the Prince of Wales, than whom no one could have been found more able to recommend the sentiments of his Royal brother.

The motion was put by THE DUKE OF ROXBURGHE and carried unanimously.

H.R.H. THE PRINCE OF WALES, in reply, said he felt sure that his brother would be not only much gratified by the kind way in which the vote of thanks had been proposed and received, but also by the kind attention which had been given to the long paper which he had felt a great pleasure in reading. It was obvious that, as the paper had taken some time, it would be better that the discussion should take place on a future occasion ; and in the meantime the paper would be circulated, so that members of the Conference would have time to look at it carefully. He should let his brother know with what applause the paper had been received, which he felt sure would be most gratifying to him, knowing how much he had this Exhibition at heart, not as it regarded the subject of fish culture only, but also as affecting the welfare of our brave fishermen. Whilst for three years he was Admiral-Superintendent of the Naval Reserve, he took great trouble to find out everything concerning them, and he had devoted a great deal of time to the preparation of this paper.



PRINCIPLES
OF
FISHERY LEGISLATION.

BY
RIGHT HON. G. SHAW-LEFEVRE, M.P.,
FIRST COMMISSIONER OF HER MAJESTY'S WORKS, ETC.; ONE OF
THE ROYAL COMMISSIONERS APPOINTED TO INQUIRE INTO THE SEA
FISHERIES OF THE UNITED KINGDOM, 1866.

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CONFERENCE ON MONDAY, JULY 9, 1883.

Earl CAIRNS in the Chair.

PRINCIPLES OF FISHERY LEGIS- LATION.

THE question which I have undertaken to bring under the attention of the Conference, namely, what legislation is expedient in respect of our sea-fisheries, may conveniently be divided under two heads :

1. Whether legislation is expedient for the purpose of increasing the supply of fish, or preventing their wasteful destruction, either by prohibiting fishing during certain seasons, or by protecting fish below a certain size, or by preventing the use of certain implements.

2. What legislation is necessary for the purpose of preserving order among fishermen on the high seas, and preventing them doing damage to the nets and implements of others.

With respect to the first of these questions, it will be admitted that regulations may be expedient and practicable in respect of those parts of the sea within the territorial jurisdiction of a country different from those which are possible on the high seas beyond such jurisdiction ; and further, that shell-fish, such as oysters and mussels, at-

tached to in-shore beds from which it may be possible almost wholly to remove them, are more under the control of legislation than other fish.

Dealing, however, in the first instance with sea-fish other than crustacea, I may remind the Conference that the principles of legislation for our sea-fisheries were determined on after a prolonged inquiry twenty years ago by a Royal Commission, of which Professor Huxley, Sir J. Caird, and myself were members; and were adopted by the Legislature in the Sea-Fisheries Act of 1868.

The Commission had been appointed in consequence of complaints from many parts of the coasts of the three countries, as to the falling off of fish. It was alleged that the trawlers, who had increased greatly in numbers during the few preceding years, had injured the fishing on the north-east coasts of England and Scotland and elsewhere, by disturbing and destroying the spawn of fish, by taking immature fish, by frightening away the shoals of fish, and generally by making it difficult and dangerous to other fishermen to prosecute their ordinary fishing.

It was complained also that the herring-fishery generally was falling off. Demands were made for the regulation of fisheries in the direction of prohibiting and restricting the use of trawls and seine nets, either generally or in our bays and estuaries, or by regulating the size of fish that should be permitted to be taken.

The Royal Commission, after full inquiry at every important fishing station in the United Kingdom, came to the conclusion that there was no ground whatever for the allegation of the falling off of any important fishery on any part of our coasts. They showed that trawling had enormously developed during the few previous years, and that there was not the slightest proof that it destroyed

spawn or did any injury to other fisheries by the capture of immature fish. They proved, also, that the herring-fishery had made substantial progress. There were, indeed, cases where the shoals of herrings had capriciously deserted certain parts of our coasts for a time ; but they had appeared in greater numbers elsewhere. There were also places where the local consumers complained of the great difficulty of getting fish, and of its high price as compared with former years, and who had jumped to the conclusion that the fisheries were falling off. It generally happened that these people were not aware that as many and even more fish were landed on their coasts, but that these fish were sent off by early trains to the inland towns ; and that the railways and telegraph, by giving greater facilities for conveyance and distribution, had equalised the price of fish, and had consequently increased its value on the coast.

The Commission was of opinion that admitting theoretically it might be possible to over-fish the sea, and to reduce the quantity of fish in it by particular methods of fishing, to a point when there would not be a sufficient stock left for breeding purposes, yet there was not the slightest reason to believe that this point had been reached or even approached. They reported that although there was a considerable destruction and waste of the fry or immature fish by trawlers, shrimpers, and seine-net fishermen in our bays and estuaries, yet that there was no reason to believe that this destruction affected in any way the general supply of fish. They held then that there was no proved necessity for any regulations as to the time of taking fish, or as to the place where fish of any size should be taken, or as to the nets or implements with which they might be taken ; they considered that

all the existing regulations with these objects might with advantage be repealed and dispensed with, that complete freedom of fishing might be granted, and that regulations should in future be confined to those having for their object only the maintenance of order and the prevention of damage by one class of fishermen to the nets and implements of others.

In 1867 I was sent to Paris, with the late Mr. Stephen Cave, by the Government of Lord Derby, as member of a joint Commission with France to settle the terms of a convention on the subject of fisheries. We found that our French colleagues were of the same opinion as ourselves upon the general question of sea-fisheries, and differed only upon some points in relation to oyster-fisheries. A Convention was made with the French Government based upon these principles. As far as this country was concerned, effect was given to this Convention by the Sea-Fisheries Act of 1868, but for some reason it has never been ratified in France.

The Act of 1868 carried out to the fullest degree the principles affirmed by the Royal Commission. It repealed a great number of regulations, many of them nearly obsolete and little acted upon; it established full liberty of fishing in any part of the sea, and in our bays and estuaries, subject only to regulations framed in the interest of order, and with a view to prevent damage. It did not, however, apply to Ireland, which had been the subject of a much more restrictive policy, especially as regards trawling in its bays and estuaries, and where there was much jealousy and fear of Imperial legislation. The oyster-fisheries were dealt with upon different principles, and subsequently the mussel and lobster fisheries were dealt with exceptionally, but no other change has since



been made in the legislation of 1868, as regards sea-fisheries in the sense I am speaking of.

Twenty years have elapsed since the inquiry by the Royal Commission, and fifteen since the Act of 1868, and it is worth while to review the principles then recommended and acted upon by the light of subsequent and recent experience.

Unfortunately we are still without any accurate statistics as to the take of fish off our coasts with the exception of the herring-fishery, and the cod and ling fishery in Scotland, with respect to which we have very accurate reports, not of the quantity of fish caught, but of the quantity which is annually cured. I find from the Scotch returns that the average cure of herrings for the five years previous to 1863, was 680,000 barrels, and for the five years ending 1881 was 1,050,000 barrels, an increase of about 50 per cent. The increase of the five years ending 1863 as compared with the five years ending 1843, was only 34 per cent. The increase, therefore, in the last 20 years has been a progressive one ; but during the same interval it is admitted that the quantity sent to market as fresh fish has also been increasing at a greater rate. It is certain, therefore, that the real increase has been even more than 50 per cent. During the same period the cure of cod and ling has increased in the same ratio—about 50 per cent. I find also that this increased take of fish has been effected by a relatively smaller proportion of fishermen. The number of fishermen engaged in these fisheries has increased by only 15 per cent, and the number of boats in the same proportion ; while the tonnage has increased by 20 per cent. On the other hand, the capital employed in nets and boats has increased in a somewhat larger proportion, namely, 75 per cent. Certainly no one who has any perception of the

meaning of facts will venture to say that they afford any cause for alarm as to the falling off of these staple fish.

We cannot follow with the same precision the course of the herring-fishery off the coast of England. I believe, however, there has been a substantial increase. In the case of trawlers, although we have no statistics as to the fish actually caught, yet we know that there has been a most conspicuous and remarkable increase in the number of vessels employed in this fishery. The four principal ports on the east coast of England for trawlers are Hull, Grimsby, Yarmouth and Ramsgate. In 1863 there were 270 trawlers hailing from Hull, and 70 from Grimsby; there are now 420 and 625 respectively. At Yarmouth they have increased from 140 to 333, and at Ramsgate from 50 to 120. Taking the four ports together the vessels engaged in trawling have increased in number from 580 to 1500; that is, they have nearly trebled in number. But this is not all; the vessels now employed in this fishery average nearly double the tonnage of those employed 20 years ago. Taking their effective fishing capacity into account, as well as their number, the increase has been six-fold. Here again I say that there is not the slightest sign of a falling off in the take of fish, but the very opposite. I believe also that I am justified in saying that there has been a very considerable increase in two other important fisheries, namely, the mackerel and sprat. When we look at our inshore fisheries,—the fisheries which of all others are presumably the most likely to do damage to the general supply of fish, as undoubtedly they destroy a great number of immature fish—namely, those which are carried on by the shrimpers and whitebait fishermen, we find that there has also been a very great increase.

I think then it may be taken as an established and incon-

trovertible fact, that not only has there been no falling off in our fisheries but a very great increase, an increase in most cases greater in proportion than in the number of men and boats employed, and giving an adequate return to the very largely increased capital devoted to them.

I might perhaps stop here and be content with establishing facts, and not attempt to assign causes or supply theories in explanation of them. It may, however, be permitted to me to recall some of the causes which have been suggested. In the first place, the area of the sea covered by the nets of our drift fishermen, and the extent of the bottom of the sea over which the trawls of the trawl-boats are dragged, form but a small extent in proportion to the total area of the seas which surround our coasts. The trawlers, for instance, fish together in great fleets; those fleets often trawl over the same ground for days and weeks together. If their aggregate courses for a year could be marked out on a chart, it would be seen how very small a portion of the bottom of the sea is raked by them. There are places like Rye Bay and Tor Bay, where for years an increasing number of trawlers have fished at seasons of the year with never failing results. It is admitted that if 20 trawlers follow one another closely over the very same track, the last has just as much chance of a good haul of fish as the first in the line.

The bottom of the sea suitable for trawling forms only a very small portion of the total area. It should be recollected also that there are vast regions of the sea around our coasts of which we know nothing. We can catch some classes of fish when they rise in shoals to the surface of the sea, and we catch others by dragging the bottom of the sea where the ground is favourable, but we know nothing of the great interval between the surface and the bottom; we are

powerless there. In some seasons on the west coasts of Scotland the herrings are known to be in the lochs, but for weeks they remain at such depths that they cannot be taken by drift nets; it is probable therefore that many shoals of fish escape us in the high seas in the same manner.

Another cause is the extraordinary fecundity of fish; this must tell especially in favour of those fish which rapidly arrive at maturity, such as herrings and sprats. The Malthusian doctrine must apply with especial force to fish—their tendency to multiply faster than their means of sustenance is obvious, and myriads in all stages of life must be saved from starvation only by being destroyed by their enemies.

Man is but one, and, probably, the least destructive of the many enemies which surround the different species of fish. From the time when the spawn is deposited by the parent fish, through all the stages of life, fish of all kinds appear to be the prey of other fish, and are constantly surrounded by their enemies. It is certain that if the cod-fish which are annually taken by the fishermen off the coast of Scotland were allowed to live a year longer they would destroy vastly more of the herrings than are taken by man during the same time, and the cod-fish actually caught form but a very small proportion of those in the sea. The late Mr. Buckland mentioned a case where in the stomach of one cod-fish thirty-two herrings were found intact and undigested; in another case a very lean cod had in its stomach five pints of sprats, and in another, thirteen large whelks and fifteen hermit crabs. But the cod-fish are but one of many enemies. The gannets alone, off the coast of Scotland, are said to consume more herrings than the fishermen catch. Many other kinds of birds feed on

herrings and their fry. The haddock, whiting, and numerous others feed on their spawn and their fry, while the ling, hake, dog-fish, and others pursue them in more advanced life. The same remarks apply to all other kinds of fish. From their birth to their end they are preyed upon, and in their turn prey upon other fish.

What is the effect of the advent of another enemy common to them all, in the shape of fishermen, in this social—or rather unsocial—economy of the sea? If the fishermen set their nets in the sea, and take from it a proportion of the total number of herrings, other fishermen at least render some assistance to the herring tribe in waging war against their enemies, in taking the cod, the haddock, the whiting, and the numerous other fish that, if left in the sea, would prey upon them. The net result of the intervention of man may in such a case be not unfavourable to the propagation of that particular species. Indirectly as much may be done tending to the increase of that species as is done directly by reducing its numbers.

This argument is not without practical proof. In or about the year 1860 there prevailed a fear that the number of herrings on the west coast of Scotland was being reduced by over fishing, and in consequence an Act was passed which provided a close time of the first five months in the year for these fish. In the next few years it was illegal for fishermen to catch herrings, even for bait, during these close months. But the cod-fishery depended upon the use of herrings for bait. The cod-fishery was practically put an end to by this prohibition to take herrings for bait. The cod-fish that were not caught, it may be presumed, fed on the herrings that would have been taken by the fishermen; for no increase was observed in the shoals of herrings. Grave complaints were made by the population of some of

the western islands that they were reduced to misery and starvation while herrings in abundance were lying in front of their shores ; other fishermen were demoralized by being tempted to break a law they knew to be unjust and unnecessary. In consequence of this the close time was abolished in 1864 for the greater part of the coast, and at a later time the prohibition was wholly repealed.

The illustration I have supplied for herrings might be drawn equally from any other variety of fish. If it be permitted to me to generalize, I might suggest that the sea produces a certain harvest of fish every year, and that in the contest for life the various species survive in certain varying proportions. Man intervenes and takes from each of them a tribute ; it may be that in doing this the balance of these conflicting species is not much disturbed. Even if in a particular part of the sea the number of fish of one or more species be sensibly reduced, the void is speedily filled by fish of the same or other varieties from other parts, or the fecundity of those which remain is so great that, in a very short time, the fish recover their numbers, and, perhaps, increase all the more from the temporary absence of their enemies.

The most serious destruction by man, and the least defensible, is that of the young and immature fish, which, if left undisturbed, might grow into larger fish, and become food for the people. It is undoubtedly the fact that immense numbers of the fry of fish are wastefully destroyed by our fishermen. The trawlers are accountable for not a few. However wide the meshes of the net, they close in the tail of the trawl, and the small fish cannot escape. These small fish are generally dead when they are brought up.

To the shrimpers in our bays and estuaries the destruc-

tion of vastly greater numbers of immature fish of all kinds is due. In many cases the shrimpers cast these fry into the sea again ; but I believe the young round fish never survive the process ; and in most cases the sifting and sorting does not take place, and cannot take place, till these little flat fish are dead ; but yet there is no sign that this destruction has any palpable effect upon the aggregate numbers, or aggregate take of other fish. I recollect well, in the course of our inquiry in 1863, going to Morecambe Bay. There had grown up in this bay within the previous ten years a very large shrimping trade. Some hundred shrimping boats were at work there, and about twelve small vessels had also for many years trawled for flounders and other flat fish in this bay. These flounder fishermen complained of the falling off of their fishing, and laid the blame of it upon the shrimpers, who destroyed so many of the small flounders. It appeared, however, that in Morecambe Bay the sea goes out at low tide immense distances, leaving shallow pools of water ; in these shallow pools small fish of many kinds are left by the retreating tide, and in hot weather the sun heats these pools, and the fry are destroyed in countless myriads. I recollect that one of these complaining flounder fishermen admitted under examination that ten thousand times greater numbers of small fish were killed by the sun in these pools than were caught by the shrimpers. What then, he was asked, does it matter if the shrimpers catch an additional one ten-thousandth part of those destroyed in the pools ? The answer was typical of a common form of argument. Providence, he said, has made allowance for the destruction in the pools, but not for the destruction by man. The Commission were of opinion that, even if the case were proved, the shrimping was a vastly more important industry than the flounder fishery.

But the cause of the falling off of the flounders was subsequently cleared up, and was not caused by the shrimpers. It seemed that in Morecambe Bay there were great scars of mussels, and that the flounders are tempted into the bay for the purpose of feeding on the young mussels; but owing to some changes in the currents or winds, the sand had been heaped upon these mussel beds, and they had greatly diminished, and as a consequence the flounders came in much fewer numbers to the bay.

Supposing it were proved to be desirable to prevent the capture of small fish in our bays and estuaries, the main difficulty in the way of any prohibition would be the shrimpers. These shrimp trawlers may be reckoned by thousands, and the capital invested in them by hundreds of thousands of pounds. If trawling is to be prohibited on the inshore fisheries, the prohibition must either apply or not apply to these shrimpers. If it is to apply to them, then an important industry would be seriously crippled, if not destroyed. If it is not to apply to them, how is it to be enforced against the deep-sea trawlers and other fishermen?

But of all the destruction of this kind, there is probably none so great as that caused by man deliberately with a view to food, namely, in the case of whitebait. Whitebait, it is now clearly ascertained, are the young of herrings and sprats. The take of whitebait has enormously increased of late years. Twenty years ago we used to go down to Greenwich to eat whitebait, and the take and consumption was within narrow limits. At the present time whitebait in great abundance are to be found at every fishmonger's, and enormous quantities are consumed in London alone. The consumption has multiplied more than fifty-fold, but, so far as can be ascertained, without any effect upon the

shoals of herrings. Sprats still continue to frequent the estuary of the Thames, in such numbers, at certain times of the year, that the markets are glutted, and large numbers of them are sold for manure. The destruction of whitebait, however, is so great, that in comparison with it the destruction of all other small fish sinks into insignificance, and it would seem absurd to take steps to prohibit the capture of other immature fish, while the capture of whitebait is permitted.

On the whole, then, I say that the facts which we are able to collect of the present state of the sea fisheries, as compared with twenty years ago, justify the principles of the legislation of 1868. The same principles were affirmed by the Report of the Fishery Inspectors in 1878, namely, of the late Mr. Buckland and Mr. Walpole, who travelled over the same ground as the Royal Commissioners, and arrived at similar conclusions.

When, however, we come to consider the inshore or coast fisheries of shell-fish, such as oysters and mussels, the question is a far more difficult one, and other considerations enter into it. Mussel-beds, for the most part, lie between high and low-water, and it is quite possible wholly to denude the banks of them. Oyster-beds in the shallow water of our estuaries may also be dredged so that the number of oysters may be very greatly reduced, and it may be that enough would not be left to supply an adequate amount of spat to re-stock the beds. The problem how best to deal with such beds is, however, a very complex one. The Royal Commission of 1863 was very sceptical as to the value of any general regulations in the direction of close time, or in the nature of a limitation of the size of the oysters permitted to be taken. A close time is but a clumsy and very ineffectual mode of giving protection to

a particular species. A close time alone would not keep up the breed of partridges or pheasants, if unrestricted shooting be permitted at other times of the year. A close time for salmon would be equally ineffectual, if the nets remained on the river at all other times, and no free course were allowed to the fish to come up the river. So a close time for oysters is useless for the purpose intended, if unrestricted dredging be permitted at all other times of the year. Granted that it is possible so to dredge an oyster-bed as to reduce the fish to a point when there are no longer oysters enough to stock the beds, this can equally be done during six or nine months of the year as during twelve months of the year; and with oysters at their present price, it is obvious that the temptation to remove by dredging every parent oyster that can be taken by a dredge is very great. Experience conclusively shows that a particular oyster-bed can, within a very short period, be reduced to a point when it is no longer worth the labour of dredging. This is frequently the case in the English Channel. When, as often happens, a new bed of oysters is discovered, dredgers assemble from all parts, and in a few weeks dredge it so completely, as to reduce it to the point when it is no longer profitable to work it. It is true that during three months of the year, the oyster while in spat, is not good for eating, and it may be asked, why take the oyster during this period? The answer is, that the dredgers are not so unwise as to sell oysters for eating during the summer season, when the price is low; they lay them down on private beds where they remain till suitable for the market. So also with respect to oysters below the ordinary size for eating. It is not like the case of immature fish; no one dredges up the

small oysters either wastefully or for the purpose of selling them immediately as food. The small oysters dredged from public grounds, are laid down on private beds, and carefully protected till they are large enough to send to market, and there is a real economy in thus collecting the small oysters from the public grounds, where they are exposed to many enemies, and laying them down and preserving them on private grounds. In the opinion of the most experienced men employed in dredging oysters, it is impossible to dredge the public grounds, when covered with water, so completely as not to leave enough oysters to supply spat in good seasons. In this view also more good is done to the public grounds, especially those in our estuaries, by dredging them in the summer months, when the mud is apt to accumulate and to destroy the holding ground for the spat when it falls, than harm can be done by reducing the number of parent oysters. However that may be, the Royal Commission was of opinion that it was useless and unwise to carry out any general regulations for all the open grounds, whether in the open sea common to all countries, or in the estuaries and bays within our territorial jurisdiction ; that the best hope for the ultimate increase of oysters lies in bringing the individual interest of private ownership to bear upon the subject ; in making grants of those parts of our estuaries, which are suitable for oyster culture, to private persons and corporations, who would thus have every inducement to cultivate the beds, and to maintain a proper stock sufficient for all purposes, and from which the spat would spread and fertilise the public grounds.

In consequence of this Report, Parliament in 1866 empowered the Board of Trade to make grants of the bottom of the sea in our bays and estuaries suitable for oyster

cultivation, and this has been acted upon in a certain number of cases. Power was also given by a subsequent Act to the Board of Trade, to authorise corporations to make any regulations they may think fit in respect of the oyster-beds within their jurisdiction, and to close them, or parts of them, altogether for a time. It must be admitted that none of these provisions or powers have produced much effect. The dearth of oysters has continued, and it is equally the case on the open grounds, on the best private grounds, such as the Whitstable beds, and the Colchester beds, and on the grounds subject to full regulations by corporations, such as those of Boston, Lynn, and Swansea, which have a very large extent under their jurisdiction.

In 1877, Parliament, after an enquiry by a Committee, from the Report of which I venture to differ, established a close time for oysters, so far as their sale is concerned. This has now been six years in operation, and has utterly failed to produce any effect.

There seems reason to believe that the oyster famine of the last few years has been mainly due to a succession of bad breeding seasons, to the fact that we have been passing through a cycle of years, when the weather during the breeding season has been very unfavourable for the deposit and growth of the oyster spat. No regulations, which private companies or public corporations have enforced, have been successful in restoring their beds.

I do not, however, propose to deal conclusively with this most important subject; it is worthy of fuller treatment than I can give to it. I have introduced it rather for the purpose of showing, that on the one hand there is an exception to the general growth and prosperity of our fisheries, and equally an exceptional case for legislation, a

least in respect of the oyster-beds within our three mile limit, though our efforts, so far, have met with no success.

If, then, with the exception of shell-fish, there is no reason to believe that the supply of fish is diminishing, and if, on the contrary, the take of fish has hitherto increased in proportion to the capital and labour expended in fishing, there can be no reason for prohibiting any particular method of fishing. Attempts have, from time to time, been made to prohibit particular kinds of fishing on the ground that they prevent others from following their avocations, or because they frighten the fish which others would take. When these are inquired into, it will generally be found, that at the root of the complaints is the jealousy caused by the use of new and more expeditious methods than the older methods.

For instance, the long-line fishermen have made great complaints against the trawlers. The trawlers cross their lines, and often carry away some of their hooks ; they take the fish the line fishermen would do. The trawlers, however, catch relatively tenfold more fish than the long-line fishermen ; and if it became a question which of the two methods is of the greater public utility, there can be but little doubt that the trawlers would carry the day. I do not know on what ground the long-line fishermen can claim the right to set lines of from four to five miles in length, and then to call upon the State to prohibit trawlers from fishing in their district to the possible damage of their hooks. It seems to me that the line fishermen must submit to a certain amount of risk of this kind, or that they would do well to avoid the ground suitable for trawling.

On the west coast of Scotland the Legislature some years ago intervened to prevent seine-net fishing for herrings, on the ground that this fishing interfered with the

drift-net fishing, and because it was complained that seining or trawling, as it is there called, frightened the herrings away from the lochs. It must be clear, however, beyond all question, to those who have seen the seine drawn, that the only fish it frightens are those which it captures, and it is equally certain that at times, and under certain conditions, it is a most expeditious and economic method of catching herrings, and one which it is most unwise to prohibit. The prohibitions were, consequently, removed. The same arguments apply to many other methods, and the only conclusion I can come to on this point is that there is no reason for prohibiting any ordinary method of fishing on the ground that it interferes unduly with others.

I have lastly to deal with the question of preserving order on the high seas, and of preventing damage by fishermen to the nets and fishing gear of others. This has become of late years a more important subject than ever, partly from the great increase in the number of fishing-boats, and especially trawlers, and the great distances to which they go from their native ports, and partly from the far greater admixture of fishing-boats of various nationalities. The question has indeed become one of very high international import.

No one can doubt that it is one of the chief functions of a government to preserve order among its subjects, and to prevent damage to their property. The high seas, however, are common to all nations, and no single nation can enforce its laws over the fishermen of others ; yet the more serious conflicts of fishermen naturally arise between those of different nationalities, partly because there is more jealousy and less common fellowship between them, and partly because, from want of a medium of communication, they cannot settle their difficulties. Two very common subjects

of dispute arise among fishermen, the one in the case of drift-net fishermen, and especially those engaged in the herring-fishery, when heavier boats with heavier nets come and shoot their nets to windward of smaller boats with lighter nets ; in such case the wind drives the heavier boats upon the others ; the lighter boats and nets get the worst of the conflict, and their fishing is destroyed ; often inextricable confusion occurs, and it may easily be supposed that in disentangling the nets the boats with larger crews again get the advantage. This is a matter of common complaint by the drift-net fishermen on the east coast of England, fishing in open boats with very light nets, against the larger boats coming from a distance, and especially French boats with heavier nets and more numerous crews. The other common subject of complaint is that trawlers come upon the ground where the drift-net fishermen have set their nets, or the line fishermen have laid their lines ; that they cross the drift-nets or lines with their trawls, causing great damage, often necessitating the cutting of the drift-nets. It is certain also that in not a few cases trawlers have carried an apparatus called a "devil," which enables them to cut right through drift-nets, to the great damage and loss of the nets.

The Act of 1868 endeavoured to meet these two cases by providing that in the case of drift-net fishing, the heavier boats coming upon fishing grounds where lighter boats were, should always set their nets to leeward of the lighter boats, and the lighter boats on the other hand, setting their nets after the heavier boats, should do so to windward ; and to meet the case of trawlers, it provided that they should not fish within three miles of drift-nets. This, however, only provided for order as between English fishermen. The same rules were agreed upon between the English and

French Commissioners as applicable to the fishermen of both countries, but unfortunately the convention has never been ratified by the French Government.

I am glad to say that recently the subject has been taken up in a wider spirit by all the governments interested in fisheries in the north of Europe. A fishery conference was held last year at the Hague, and a common understanding was arrived at which has been embodied in a convention, and a Bill for carrying this into effect is now before Parliament. It has adopted the English rule with respect to drift-net fishing ; in regard to trawlers it has made a change for the better. It has abandoned the attempt to prescribe a distance within which the trawls must not approach the drift-nets ; it lays down the rule that where trawl fishermen are in sight of drift-net or long-line fishermen they must take all necessary steps to avoid doing injury to the latter. Where damage is done the responsibility is to lie with the trawlers, unless they can prove that they were under the stress of compulsory circumstances, or that the loss sustained did not result from their fault. It also provides that, when nets belonging to different fishermen get foul of each other, they shall not be cut without the consent of both parties. The use of any instrument or engine which serves only to cut or destroy nets is forbidden.

The difficulty, however, is not so much in laying down rules for fishermen, as in applying them and carrying them out ; and there is still so much jealousy among people of different countries that they will not trust the tribunals of one another to decide upon such questions. The Convention, however, has gone as far as possible without infringing on this principle. It provides that the commanders of cruisers of different countries shall have power to interfere in cases of dispute and damage between fishermen of

different countries, and to arbitrate between them at sea and to fix the amount of compensation to be paid ; in serious cases when the parties do not agree to an arbitration, they are empowered to authenticate any infractions of the rules laid down, and to take the fishing-boat which is culpable to the nearest port of the country to which it belongs for the purpose of adjudication.

This in most cases may be a circuitous and lengthy process ; if for instance a French fishing-boat commits a serious infraction of the rules against an English boat off the English coast just outside the three-mile limit, in such a case the English cruiser cannot take the offender into the English port, but must take the French boat to a distant French port for adjudication. It is to be observed, however, that such a proceeding would destroy the season's fishing for the boat in question, and the mere threat of such a course would probably bring the offenders to reason and induce them to submit to arbitration. It is greatly to be hoped, therefore, that the Convention will be productive of good results, and will be the means of preserving order among fishermen. The contemplation, however, of its clauses will only serve to strengthen the arguments as to the difficulty of carrying out any general rules for the regulation of the supply of fish, either in the direction of a close time, or as to the size of fish on the high seas. It would be necessary for this purpose to secure the assent of all the Governments of the north of Europe, otherwise we should throw the industry into the hands of those who do not agree. Should agreement be arrived at, it would be very difficult to enforce any such regulations so long as the jealousy of submitting the fishermen of one country to the tribunals of another continues to exist.

In conclusion, then, I have to submit to the Conference,

(1) that legislation in respect of our sea-fisheries on the high seas beyond the three-mile limit should be confined to regulations for preserving order among fishermen and preventing damage, and that there is no ground for supposing that any benefit would result from any prohibitions and regulations as to particular methods and times of fishing, or any restrictions as to the size of fish ; (2) that with respect to fisheries in our bays and estuaries there is equally no reason to believe that the destruction of immature fish by shrimpers, trawlers and seine-nets, or the take of whitebait for food, has been productive of any injury to our fisheries as a whole ; (3) that the case of oysters, mussels and other shell-fish on the coasts of this country, differs from that of other fish, inasmuch as the control over the beds to which they are attached is far greater both for destruction or preservation, and that legislation consequently is expedient ; and that the nearer such legislation approaches to the conversion of such beds into private property, or to giving to local authorities all the powers over them which private owners would have, the more likely it is to be successful.

DISCUSSION.

Mr. J. C. BLOOMFIELD, after expressing his high sense of the value of the paper which had been read, proceeded to refer to the fisheries on the west coast of Ireland, with regard to which he concurred in the observation which had been made, that the prohibition of trawling had not been of service to the fisheries as a whole. There had been a great deal of complaint by the long-line fishermen against trawlers, which upon investigation did not appear to be well founded. The great difficulty they experienced in

Ireland was means of transit for bringing the fish which might be caught to the English markets, and he hoped something would be done in that respect. He hoped the English people would look at this question from an Irish and an Imperial point of view, and would not suffer all this enormous quantity of fish to be wasted. He did not think they required loans of money to provide nets or boats for fishing, but they did want better and cheaper means of transit, and a break-up of anything like monopoly or "rings" in dealing with fish. If this could be accomplished he felt certain that such a supply of fish could be brought from Ireland as would enable the poor of London to obtain as much sustenance for 2*d.* as they could now get for 2*s.*

Dr. FRANCIS DAY thought some question had been omitted in the consideration of the present state of our fisheries. On looking to the report of the Commission of 1866, he turned first of all to see what was the opinion of the fishermen on these questions, but the report represented that the fishermen's opinion was worthless, that they knew nothing about fish except how to catch them. It seemed to him they ought to know a little more about the breeding of fish before any definite conclusion could be arrived at with reference to sea fisheries. Mr. Shaw-Lefevre had given very interesting statistics with reference to herring and also to cod, but he had omitted to say that although fishermen had not increased, cotton nets had increased more than five-fold to what they were twenty or thirty years ago, which must make a considerable difference in the taking of fish. Another important question was the kind of fish supplied. Though the supply of herrings had increased, it did not follow that the supply generally of naddocks and other fish had done so. It was very doubtful

whether fishing would destroy the large shoals of gregarious fish such as the mackerel, herring, pilchard, and sprat, but when in-shore fisheries were considered it might be very different. He had been round various parts of the coast, both north, south, and east, and he heard the same complaint from fishermen in all quarters, that they were catching fewer fish in shore, that they had to go farther out, and what they did catch were not the size that they caught twenty years ago. That was a question that he thought required investigation. He was not at all satisfied that all these fishermen were making false complaints. Then, with regard to the crab- and lobster-fisheries, in 1880 a petition came from Norfolk that protection should be introduced. The late Mr. Buckland went down, an investigation was made, and the petition granted, and in less than three years crabs and lobsters increased five-fold. So convinced were the fishermen of the efficacy of this legislation, that they had petitioned to have the laws re-enacted, and he believed they were continued for ten years more. He thought it would be a very good thing if statistics were kept of the fish sent to market, not the gross amount only, but to convey the information of what varieties the large supply consisted; they were told that the gross supply had increased, but it was also said that many fish were now brought to market which twenty years ago were never sent to London, being of a coarser kind. He thought, also, there should be an independent inquiry as to the result of the abrogation of the fishing laws in 1866, or thereabouts; it might be that the fisheries improved, or it might be the reverse, but he could not help thinking it would be very useful to have such an inquiry, and more complete statistical information.

The MARQUIS OF EXETER, in proposing a vote of thanks

to Mr. Shaw-Lefevre, said he agreed entirely with the conclusions that gentleman had come to with regard to sea fisheries as far as his experience went. He did not think you could overfish the ocean, and if fishermen could be brought to agree better among themselves, and not to impede each other in their several branches of fishing, so far as British fisheries were concerned they would go on very well. But there was the difficulty that had been referred to, that they had sometimes to contend with the invasion of foreigners, who not unfrequently appeared in larger boats, better manned than our own, and, therefore, it was desirable that legislation should be introduced for the sake of dealing with these difficulties. With regard to the oyster, however, he thought there was a danger of their being over-dredged. When his right hon. friend stayed with him some years ago in the Isle of Wight, he called his attention to the innumerable fleet from Colchester and other places, which were swarming in the Solent, dredging up and down continually in front of Ryde, which carried away every little oyster they could find, in order to lay them down in the Whitstable and Colchester beds. The consequence was that there was hardly an oyster now to be found on those beds, whereas in times past he used to catch a very fair hauling.

Mr. WILLIAMSON, M.P., had much pleasure in seconding the motion.

The CHAIRMAN said he could not put this resolution without saying a word or two to express the very great pleasure which he had felt in hearing Mr. Shaw-Lefevre's interesting Paper, which he was quite sure would be a great benefit to the public when it was published. He would not express any opinion on the various points of difference which might have arisen between the conclusions expressed

in the Paper, and those of Dr. Day ; but he owned that he inclined very much to lean, if possible, to the conclusion at which Mr. Shaw-Lefevre had arrived, that the policy which had been pursued in giving up the attempt to legislate with regard to catching fish on the high seas was a wise policy. He felt quite satisfied that every one ought to be glad to welcome a conclusion of that kind, if it were at all sound, because he was perfectly persuaded that in dealing with such a subject as fishing on the high seas, any legislation must absolutely fail, and that it would be quite impossible to give it any practical effect. Of course, he did not mean this to apply to any minor legislation. If, for instance, any injury was done by the undue consumption of whitebait, that was a matter which could be easily dealt with by restriction ; but on such a point he would not offer any opinion. He felt convinced that anything man could do in the way of fishing on the high seas was, after all, a mere flea-bite compared with the amount of destruction that was effected by the fish themselves. That was a provision of nature, and anything that man could do was but a small part in comparison. It was a very remarkable thing that fish seemed by nature to be provided not merely with power to take each other by force, but to adopt stratagem for the purpose of catching one another. Possibly some present might have seen what sometimes occurred in trawling-boats, especially on the northern coast. They brought up from the bottom of the sea a fish called the devil-fish, some of which were nearly as large as the table before him. It was a flat-fish, and at first sight appeared to have no feet, but it had little feet underneath which it could tuck up or let down as it pleased. If they were tucked up the fish could lie flat on the bottom, but if he put them down he could run along readily. It had a

mouth nearly as wide as the widest part of its body, and just above its head were two long rods which it could elevate, or which at other times lay flat on its back; when erect they shook exactly like two fishing-rods in the current of the water, and there was a little thing on the top of them which looked like a bait. The devil-fish lay at the bottom of the sea, and the fish, thinking there was something to catch, came up to investigate, when this devil-fish opened its huge mouth and swallowed them down; in fact, it seemed to be quite equal to the most adroit fisherman. Though he agreed in thinking that the policy of having no regulation with regard to deep fisheries was the right policy, he also agreed with Dr. Day that it would be very desirable to have accurate statistical information with regard to the consumption of fish, and the relative consumption in different years. At the same time he did not think much information was to be derived from the opinions of individual fishermen. He had not the least doubt that if you went round the coast, every fisherman you spoke to would say that fishing was much worse now than it was twenty years ago, that the fish were smaller, more difficult to catch, and that there were not so many of them; but such information was not worth very much. With regard to the preservation of order on the fishing-grounds, there was no doubt legislation was desirable. As far as the territorial grounds of Great Britain were concerned, we could provide that ourselves; but outside territorial waters, it could only be done with the consent of other nations, and he was glad to find that the Convention for the North Sea had been entered into by the European states, and that force would be given to it. It was very remarkable how fishing had gone on in distant places without legislation of that kind,

by a sort of convention which had been come to amongst the fishermen themselves. For instance, the whale-fishery, which proceeded from Aberdeen for year after year, had a kind of code of laws manufactured by itself, and the Courts of Scotland took notice of that code, and if any whaling-ship were to have a dispute in the North Sea, when they came home next year the courts would settle that dispute according to this particular code of law which had grown up in the course of years. It was very desirable, however, to have a convention which would enable the law to be clearly known and enforced in all the northern seas.

The resolution having been carried unanimously,

Mr. SHAW-LEFEVRE, in reply, said he had purposely abstained from going at any length into the question of the Irish fisheries, because it might raise some very debatable points. He had, however, pointed out that a somewhat different policy had been pursued in Ireland from that pursued in England, trawling having been prohibited in most of the bays and loughs of Ireland; but he thought it could be proved that that prohibition had not resulted in an increase of the Irish fisheries; on the contrary, he believed it was one of the causes of the unfortunate want of progress which they had shown. At the same time he was bound to say that he did not believe that there was such a mine of wealth in the fisheries of the West of Ireland as some people believed. Not that there were not plenty of fish, but the weather was so stormy, and the sea took so long in settling down, that he had grave doubts whether any substantial fishery could be established and continued week after week off that coast, as was the case on the east coast of England. If they could be established, he was quite sure that every-

one would rejoice at Ireland having another outlet for her industry.

Earl DUCIE then moved a vote of thanks to Lord Cairns for taking the Chair.

Mr. C. CECIL TREVOR (Board of Trade) had great pleasure in seconding the motion, not only from a piscatorial point of view, but also from a legal and personal one, because they might all rest confident that if legislation should be required with regard to fisheries, they would, at least in one House of Parliament, have the advantage of the judicial mind and rare legislative qualities of the noble lord in the chair brought to bear upon it.

(The resolution was carried unanimously.)



FISH TRANSPORT
AND
FISH MARKETS.

BY
HIS EXCELLENCY SPENCER WALPOLE,
LIEUT.-GOVERNOR OF THE ISLE OF MAN, AND FORMERLY ONE OF
H.M. INSPECTORS OF SALMON FISHERIES.

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CONFERENCE ON TUESDAY, JULY 10, 1883.

J. H. FORDHAM, Esq. (Ex-Prime Warden of the Fish-mongers' Company), in the Chair.

THE CHAIRMAN, in introducing Mr. Walpole, said various papers had been read at these Conferences relating to fisheries, but the subject to-day was one which came home to all, and the Executive Committee of the Exhibition hoped that one of the outcomes of the Exhibition might be to facilitate or improve the supply of fish to the Metropolis, which could only be done by an efficient system of transport whereby the markets could be supplied, and by those markets being put on a thoroughly efficient and proper footing. He hoped this paper might throw some light on these important subjects as they would expect it to do, considering that the author was a gentleman who for some years held the important position of Inspector of Salmon Fisheries in England, and who had since been promoted to the distinguished post of Governor of the Isle of Man.

FISH TRANSPORT AND FISH MARKETS.

Mr. SPENCER WALPOLE :—The subject on which I have undertaken to address you to-day is in one sense a very large one. The question of fish transport and fish markets opens up indirectly almost every topic connected with

fishing and fisheries. If, however, I were to attempt any elaborate review of the fish trade of these islands, I should probably exceed my own powers and I should certainly exhaust your patience. Instead of doing so, therefore, I shall confine most of the remarks I propose to make to you this afternoon to some of the salient points connected with the internal traffic of fish in this country.

Before doing so, however, I should like to make one or two observations respecting our foreign trade in fish, because that subject, I think, is one which is not fully understood. Last year we imported into this country fish worth, in round numbers, £1,660,000, and we exported from the country fish worth £1,820,000. In point of value, therefore, the exports of fish almost balance the imports—there is no great difference between the two. In point of quantity, however, there is a very great difference. I believe that the amount of fish imported into this country was about 45,000 tons, whilst the amount of fish which we sent abroad probably reached 110,000 tons. The fish which we imported from abroad, at any rate that proportion of fish which the Board of Trade includes in their trade returns, consisted almost entirely of salt fish—most of the salt fish which we eat on the first and last days of Lent was presumably taken off the coasts of Norway and Newfoundland. But I believe there is a considerable import of fish which is not recognised by the Board of Trade. For instance, the large salmon which arrive in the autumn in London, which you may see in any fishmonger's shop in London, come from the Rhine. The lobsters which you are eating now come from Norway; whilst the American canneries, to adopt a word which the Americans have coined, send us large and increasing

quantities of tinned fish as food, which I cannot find any trace of in the Board of Trade returns. I imagine they are included under the general term of "Meat preserved otherwise than by salting." With respect to the export of fish, the exports consist also chiefly of salt fish, the great staple of export being Scotch herrings. I believe some 90,000 tons of Scotch herrings are sent annually to Germany and Russia. There is, however, a considerable export trade of other fish. For instance, large quantities of pilchards are exported from Cornwall; and a considerable amount of fresh fish is sent to the great continental markets. The question of fish transport has, I need hardly add, a close connection with these exports.

After these very few observations on the export trade, I should like to deal with the much larger question of the internal trade in fish. I see that an illustrious Duke, in a paper read at one of these Conferences, has estimated the gross take of fish in British waters at 615,000 tons a year. I should like here to bear my testimony to the extreme importance of the figures which the Duke of Edinburgh has given in that paper. His is the first attempt, so far as I am aware, to estimate approximately the amount of fish taken by fishermen in this country; and I can only express a hope that the example which he has set will be followed by his successors, and that as one Admiral Superintendent of Naval Reserves has shown that the coast-guard may be utilised for obtaining important information of this kind, the Government of this country will take care that the coast-guard will be regularly employed to obtain similar information. Now with respect to this 615,000 tons of fish, I find if we add to it the 45,000 tons which are imported from abroad, and if, on the other hand, we subtract from it the 110,000

in the Paper, and those of Dr. Day ; but he owned that he inclined very much to lean, if possible, to the conclusion at which Mr. Shaw-Lefevre had arrived, that the policy which had been pursued in giving up the attempt to legislate with regard to catching fish on the high seas was a wise policy. He felt quite satisfied that every one ought to be glad to welcome a conclusion of that kind, if it were at all sound, because he was perfectly persuaded that in dealing with such a subject as fishing on the high seas, any legislation must absolutely fail, and that it would be quite impossible to give it any practical effect. Of course, he did not mean this to apply to any minor legislation. If, for instance, any injury was done by the undue consumption of whitebait, that was a matter which could be easily dealt with by restriction ; but on such a point he would not offer any opinion. He felt convinced that anything man could do in the way of fishing on the high seas was, after all, a mere flea-bite compared with the amount of destruction that was effected by the fish themselves. That was a provision of nature, and anything that man could do was but a small part in comparison. It was a very remarkable thing that fish seemed by nature to be provided not merely with power to take each other by force, but to adopt stratagem for the purpose of catching one another. Possibly some present might have seen what sometimes occurred in trawling-boats, especially on the northern coast. They brought up from the bottom of the sea a fish called the devil-fish, some of which were nearly as large as the table before him. It was a flat-fish, and at first sight appeared to have no feet, but it had little feet underneath which it could tuck up or let down as it pleased. If they were tucked up the fish could lie flat on the bottom, but if he put them down he could run along readily. It had a

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The resolution having been carried unanimously,

Mr. SHAW-LEFEVRE, in reply, said he had purposely abstained from going at any length into the question of the Irish fisheries, because it might raise some very debatable points. He had, however, pointed out that a somewhat different policy had been pursued in Ireland from that pursued in England, trawling having been prohibited in most of the bays and loughs of Ireland; but he thought it could be proved that that prohibition had not resulted in an increase of the Irish fisheries; on the contrary, he believed it was one of the causes of the unfortunate want of progress which they had shown. At the same time he was bound to say that he did not believe that there was such a mine of wealth in the fisheries of the West of Ireland as some people believed. Not that there were not plenty of fish, but the weather was so stormy, and the sea took so long in settling down, that he had grave doubts whether any substantial fishery could be established and continued week after week off that coast, as was the case on the east coast of England. If they could be established, he was quite sure that every-

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(The resolution was carried unanimously.)

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VOL. IV.—C.

to concentrate themselves in particular localities, and I feel that it ought to be our policy to try to work with the tendency of trade, and not to work in opposition to it; if we find a trade endeavouring to concentrate itself in one place, it would be as unwise in us to endeavour to divide it into two places as to attempt that proverbially difficult task of trying to make water flow up-hill. It is obvious why trade tends to concentrate itself in one spot. It is obviously to the convenience of buyers in a wholesale trade that, when they go in the morning for their fish, they should be certain on the spot to which they resort to find all the fish on sale on that particular morning. In any other event it must occasionally happen that the buyers will go to one place, while the fish may possibly be in another, and that state of things must necessarily lead to a practice which, I believe, the Americans call cornering, which is certainly most injurious to the interests of the purchaser as well as the consumer. I think, therefore, that we ought to make it an object to have one great wholesale market in London, and that one great wholesale market should be on the waterside.

I do not know whether you have ever considered what the requirements of a wholesale market should be. They can be very briefly stated, and I will endeavour to explain them to you. In the first place, there should be ample accommodation afforded to all the buyers and sellers who frequent the market; in the next place, there should be ample standing room for the vans which bring the fish to market; and, in the third place, there should be easy access both for buyers and sellers. I should say at once that if Billingsgate provides adequate accommodation, which is extremely doubtful, for buyers and sellers, it is lamentably deficient in the two other requirements of a

wholesale market, viz., in the standing room for vans being unpacked in the neighbourhood of the market, and in access to and from the market.

You will probably ask me to express some opinion whether, under these circumstances, an effort should be made to improve Billingsgate, or whether, on the contrary, the market should be at once swept away or moved to some other spot in the metropolis. Now on that point I am not prepared to state an opinion. It does not seem to me to be one for me to pronounce a positive opinion about. The question is one mainly of expense, and must be decided by the Corporation of the City of London, who are the owners of the market. If the Corporation are prepared to incur the great expense which is involved in doubling the area of this market as it stands, and in widening Thames Street from end to end, then I should say by all means leave Billingsgate where it is, for the very sufficient reason that trade is a conservative thing, and it is very difficult to move a trade from any spot where you find it flourishing. But if, on the contrary, the Corporation of the City of London are not prepared to incur this expenditure, then the sooner they make up their minds to move the market to some suitable place on the river-side the better it will be for the fish trade, and the better for the public also. These are really all the remarks I have to make on this portion of the subject.

Before I sit down I should like to make one or two general remarks on the subject of fisheries. It is now more than sixteen years since my connection with the fisheries of this country began, and it is a little more than a year since my connection with them was severed. But I need hardly say I have not ceased to take an interest in the fisheries of this great country. On the contrary, my lot is

now cast in an island whose people are more dependent on fisheries than the people in any other part of Her Majesty's dominions. I believe the Isle of Man contains more fishermen, in proportion to its people, than any spot over which Her Majesty rules in any other part of the world. I need hardly say, therefore, that the change in my position does not diminish my interest in the fisheries of this country ; but I am often tempted to contrast the different position in which the fisheries now stand to that which they occupied when I was first connected with them some sixteen years ago. At that time, outside the circle of the fishermen themselves, or the people resident in the neighbourhood of the ports and rivers, there were, I think, very few people in this country who took any deep interest in the question of developing fisheries. At the present time, on the contrary, the greater portion of the people in every class of life seem to consider the development of the fisheries of this country as the one and main reason of their existence. Her Majesty's sons set a laudable example by attending public meetings on fishery matters, and by preparing and reading fishery papers at fishery conferences. A session never passes in the House of Commons in which almost dozens of fishing Bills are not presented for the consideration of the Legislature. Now I am often tempted to think that there is more danger to the fishing interests of this country, in the attention which they are now receiving, than in the neglect from which they previously suffered ; and I will tell you why, as the remark seems a little paradoxical. There are two classes of persons who are perpetually agitating and bringing forward proposals on the subject of fisheries. One of these classes seems filled with the constant apprehension that the fish in the ocean are likely to be almost immediately exhausted

by the operations of man. The other section of the community to which I have referred seems also to be filled with the notion that the fisheries cannot flourish without the direct patronage and encouragement of the State or individuals. I should like to say a few words on each of these points. On the first of them I should like to add my humble testimony, for what it may be worth, to the wise words which have already been addressed to you by my friend and late colleague, the President of the Royal Society. I do not believe that the fisheries of the ocean can ever be exhausted by any operations which man is likely to undertake, and I am quite sure that the ocean is producing still as abundantly the moving creature that hath life, as it did when the first chapter of Genesis was written. I do, therefore, hope that whatever may be the outcome of this Exhibition, and of these Conferences, that no steps may be taken to impose unnecessary restrictions on fishermen, but that fishermen may be left, in Professor Huxley's words, to go on fishing where they like, when they like, and how they like. I do not mean that there are not minor points on which an exception may not be made to the rule—exceptions may be made to most general propositions of this character, though as a general proposition, I desire to support as strongly as I can Professor Huxley's advice.

But I wish further to say a few words to those benevolent individuals, for whom I have the greatest possible respect, who are always endeavouring to foster fisheries where they do not exist, by a patronage which I believe to be fatal to their prosperity. The fishermen of this country have risen to independence by their own industry; do not do them, I beseech you, the disservice of teaching them to be dependent on your charity. We can easily

ascertain from past history what has come of patronage of this kind. During the last century the British Legislature, from the best motives, endeavoured to promote a fishery for herrings on the west coast of Scotland; two societies, one of them with the Prince of Wales at its head, were formed for the purpose, and large amounts of money were subscribed, yet the objects of neither society were accomplished; and, at the present moment, the west coast of Scotland is being fished, and will be fished by boats from the east coast of Scotland, where they had no aid of the kind ever given to them. I do not like to refer to the case of Ireland, for I have so much sympathy with that country that I do not like to seem to say anything which might be thought injurious to any Irishman; but I cannot help saying that while you are endeavouring to foster Irish fisheries now by State patronage, the Irish seas are being swept by English, Scotch, and Manx boats; by fishermen who have an hereditary aptitude for fishing, and into whose hands the fish trade is consequently passing. While, therefore, I am opposed on the one hand to the imposition of unnecessary restrictions on fishermen, so I am opposed on the other to all patronage simply as such, because I believe the best part of the British fishermen is the independence which they enjoy; and God forbid that the independence which they have won by their own efforts should be taken away from them by the patronage of other people.

DISCUSSION.

Mr. J. C. BLOOMFIELD said he should have felt some diffidence in offering any remarks, but that he was supported on his left by a friend of his, a banker of Skibbereen, and there were one or two things he should like to say with regard to this question of transit. From the document issued by the London and North-Western Railway Company, he found that there were two different rates for carriage, one called the ordinary rate, and the other the owner's risk rate ; the ordinary rate from North Wall to London was seven shillings a hundredweight, and the owner's risk rate five shillings and threepence a hundredweight ; but in the case of a perishable commodity like fish, the latter rate was, of course, quite inapplicable ; but it was not only the question of rates, but of delay which occurred, and his friend, to whom he had just referred, had been obliged to come to London in consequence of the number of complaints he received of the fish arriving late in the market. On one occasion he sent a man by one of the steamers going to Milford, and he found that when the steamer arrived at Milford at 7 P.M., 100 boxes of fish were discharged, but only a portion of them left at eight the same evening, and the remainder at half-past five the next morning ; being left on the quay the fish in the interval were exposed to the rain, which washed all the ice out of the boxes, and very often the boxes were not unloaded for three hours after the arrival of the steamers. Yet the Great Western Railway Company admitted receiving as much as £20,000 in three months for this traffic during the run of the mackerel-fishing, and surely they ought to provide more reasonable facilities. In consequence of these

delays a large portion of the supply now went to Liverpool and other towns in the north of England instead of London ; but even there the same kind of difficulties occurred. On one occasion, the railway company undertook to provide a special train ; but though the fish was sent off on Thursday, it did not reach Liverpool till the Monday morning, and his friend received a telegram on the Tuesday : "Your fish were condemned this morning as unsuitable for human food." The only remedy suggested was competition ; but how was poor Skibbereen to run steamers to London in competition with the railways. Mr. Walpole had referred to the small amount of fish caught by Irish fishermen ; but he forgot that owing to the want of transit, immense quantities of mackerel were sometimes caught which never came to market. He had a letter which showed that 30,000 mackerel were caught in one day, but not one found a market outside the immediate vicinity of the place where they were caught. There seemed to be a very prevalent idea that the people in Ireland could do nothing ; but he hoped before long this would be removed. The gentleman who read the Paper on the previous day, had referred to the west coast of Ireland, and said he knew the fish were there, but the fishing could not be carried on on account of the tempests. There was no doubt that there were very strong winds prevailing generally six to seven months in the year ; but a very short time ago he heard evidence given before a Committee of the House of Commons by the head of the Poor Law Board, that fishing could be carried on there throughout the whole year. He was sure that the people of London would be glad to hear that these teeming waters of Donegal could be fished. It was not patronage that they asked for, but facilities of transit to convey the fish to the consumer, and

he was sure Mr. Walpole did not mean, when referring to patronage, to means of transit being facilitated by the granting of a certain amount of loans. It was the most mischievous thing that any person in Ireland was to be kept up by public loans or public works, at the same time it would be wrong for any Irishman to deny that the Baroness Burdett-Coutts had done a great deal for Irishmen in the south of Ireland. She had expended £10,000 in his friend's locality; the people paid 10 per cent. on the loans, and paid it willingly. He trusted that two things would happen as the result of this Conference, first that people would be convinced that something beyond competition by water was required; and, secondly, that no sort of patronage or assistance should be given beyond what was legally right. On his part, and on the part of his friends in Ireland, he earnestly thanked the Committee for these Papers, and only wished that the opportunity was more appreciated by his countrymen who called themselves patriots, and who certainly ought to take advantage of such opportunities for advancing the interests of their country.

Mr. SAYER said it was quite true, as the last speaker had said, that the carriage of mackerel was ten shillings a box, or five pounds a ton, and steamers had been put on for bringing mackerel from the west of Ireland and Skibbereen to the London markets, and the mackerel was brought until it was sold for less than the railway carriage. The carriage of a hundredweight of mackerel was 10s., and he had seen it sold as low as 8s.; so that Billingsgate could take any amount of fish. During his experience of forty years, he had never known too much fish to come there. All they wanted was the approaches widened and the railway rates reduced, when there was no doubt

that nearly twice the quantity of fish would come. He was at Stornoway not long ago, and saw shipload after shipload being loaded for the Continent, nearly all of which would come to London if the rates of carriage were lower. The cost of bringing these to London was 5s. to 10s. per barrel, and if they were brought by railway they would be 12s., whilst they could be taken to the Continent for 1s. 6d. He thought there ought to be an agitation got up to secure something like reasonable rates for fish, for he considered it infamous that coals could be brought for 8s. 4d. a ton, when fish were charged 65s. He had waited on the railway companies time after time, and asked them to reduce their rates for Irish and Scotch fish, for both countries had a very great grievance in this respect. Steamers had now been put on to bring fish from the North Sea, simply because of the high railway rates, and on the previous day the first steamer arrived at Nicholson's Wharf with 1,000 barrels of herrings from Fraserburgh. He hoped before the Exhibition had closed, something would be done by the Executive Committee, or by Parliament, either to take the railways into their own hands, or to provide for a uniform rate, because when you had a mackerel on your table it was of the same value whether it came from Ramsgate, Scotland, or from Ireland. They had all heard a great deal about a "ring," and about the evil doings of Billingsgate, but what had Billingsgate done? It had supplied 500 tons of fish a day on an average, at about 1½d. to 2d. a pound, the inexpensive fish, such as was being cooked in the School of Cookery, and supplied in the Exhibition at 6d. a plate. Billingsgate was the cheapest market in the world, and besides that there were forty markets round about London already; he referred to such markets as

Leather Lane, Whitecross Street, and Whitechapel—the kerbstone market, as he called it, where costermongers sold their fish at about 10 per cent. above the wholesale price at Billingsgate. The poor did get cheap fish, and the rich could, if they liked, if they would only do as their grandmothers did, take their basket on their arms and go with their money in their hands. But what were the fishmongers to do? They expected him to call at the house and ask, “Any fish to-day?” “No, not to-day;” and then he came again to-morrow, and perhaps got an order for a whiting or a sole, and perhaps he got paid for it, and perhaps he did not, after giving twelve months’ credit. They could not expect any fishmonger to do that without charging for it.

Mr. CAYLEY said he was not connected in any way with the fish trade, but simply spoke as a member of the public. Although Mr. Walpole declined to express any very strong opinion about the deficiency or otherwise of Billingsgate, he thought the inference to be gathered from his remarks was that Billingsgate was deficient in accommodation, but not in men of honour and enterprise. It was only fair to remember that Billingsgate was a very old institution, that London had increased in population, and consequently the demand for fish had increased to a very much larger extent than the accommodation at Billingsgate; this was admitted on all hands. He should be glad if Mr. Walpole would kindly state whether an opinion expressed in a daily paper some few days ago, as having his sanction and that of another gentleman who stood very high on this matter, was correct, that if the fish could be discharged some twenty miles down the river, and brought from there to market direct, instead of being brought up to the market in the ships, that that arrangement alone would probably

result in doubling the supply in twelve months. The answer to that question would make a material difference in the selection of a probable new market. He should not like to say that Billingsgate was going to be done away with in favour of a new market, nor did he think it would be a sensible thing to say, especially after the remarks of Mr. Sayer, a gentleman of very large business enterprise in Billingsgate, but he did think the tendency of that gentleman's remarks was rather different from what he intended. It seemed extraordinary that these Billingsgate gentlemen themselves did not enter into some understanding with each other to break through the extraordinary trammels which seemed to restrict their business, and to decide that they would compete with other markets which were springing up throughout England and the Continent, by determining that either they would have better accommodation at Billingsgate, or establish a new market. Mr. Walpole had inferentially indicated that at least it was possible that a new market might be constructed, and had indicated some points which were necessary to a fish market, but it seemed to him that those qualifications should be a little extended. The first and main thing was the geographical position, which should be as nearly as possible central, not, perhaps, in the centre of habitations, but in the centre of communication; then, if possible, there should be railway communication running through the floor of the market, there should be plenty of room for all the requirements of the market, room for buyers and sellers, wholesale, semi-wholesale, and retail, room for the public in as large numbers as thought proper to come; there should also be room for a promenade, shops, curing establishments, ice-house, and other things connected with the market. Then came the question where the locality

should be, and, if these rules were accepted, it seemed to him that pretty nearly indicated where this locality must be. If the locality were to be on the water-side, that limited it to the river, and if it were to be where the railways and the water met, there were but some three or four crossings, and if a space could be found for a market large enough where all these requirements met together, that seemed to be the place for the purpose.

Mr. SAYER said it would be quite out of the question to suppose that room for curing establishments could be connected with the fish-market ; one of his curing premises alone occupied an acre of ground. Fish was best cured as soon as possible after it was caught, and the sooner it was eaten the better it was.

Professor HUXLEY then moved a vote of thanks to Mr. Spencer Walpole. He had been struck in the course of Mr. Walpole's remarks with the fullness of knowledge, calmness of judgment, and clear reasoning, which made him so very precious to him as a colleague during the time they were associated together ; there was now an appropriate fitness of things in his being transferred from the position in which it was his duty to know about fish, to one in which he reigned supreme master both as to temporal and spiritual powers over a semi-amphibious population ; and he had listened with extreme interest to the address, and, so far as his inquiries had led him to deal with the particular subject of the paper, must express his entire concurrence in what had been said. On the other hand, it was particularly satisfactory to him to hear the addendum which he had been kind enough to make respecting the general policy of fishery and fishing, for he could not but feel that, since he had the honour of delivering the opening address at this series of Conferences, there were a great number of people

to whom he had taken somewhat the semblance of a red rag to a bull, so that whatever discussion he had happened to be present at until this one, there had been a vehement outburst of objection to the doctrine of not interfering when you did not know what you were about, which he had ventured to broach, and which seemed to him the simplest and most straightforward doctrine in the world. He should be glad to say a word on this topic, having by accident been absent on the previous day, when Mr. Shaw-Lefevre read a paper, though it was doing what he himself deprecated, dealing with a matter which was not exactly the one before the Conference. What he wished to say was this, that he did not come to the conclusion which he had advocated now for so many years, on the sort of grounds that actuated a *doctrinaire* man of science ; on the contrary, nothing could be more distinctly and emphatically practical than the reasons which first impressed on his mind the impolicy which existed twenty-five years ago, and which he was happy to think, with the help of his colleague, Sir James Caird, and Mr. Shaw-Lefevre, he had some hand in getting rid of. He would mention an occurrence which made an indelible impression on his mind. When he and his colleagues visited the Isle of Skye, the worst part of Ireland, that which was in the most depressed state, could not show a population in greater misery than the people who were to be seen within a mile and a half of Portreath. He had journeyed in many parts of the world and seen many savage people, but the population of New Guinea, about which they had heard so much lately, and where he had been a great many years, was vastly better provided with the comforts, decencies, and refinements of life than many of their fellow-subjects in the Isle of Skye were twenty years ago. He should imagine that

at that time the total earnings of one of those peasants, he might say his whole property and everything belonging to him would not come to more than £5. Certain interested parties in Glasgow some years before, for no other purpose that he could hear of but a desire to clear their own markets, had got a law smuggled through the House of Commons, where nobody cared anything about it, by which it was made penal to catch a herring during the three summer months of the year, a time at which herrings were swarming in innumerable millions. The Act was of so stringent a character that the mere fact of finding scales in the boat was sufficient to insure a man's conviction, and he was fineable £5 or more. That meant that he would be totally ruined or might be put in prison for doing this ; or even for the suspicion of having done it. Now there was not the smallest imaginable reason why that enactment should have been passed. It was a stupid, mischievous and utterly useless thing. Yet because there was no one of sufficient intelligence to understand the interests of these unhappy people they were fined and imprisoned in this way at a time when their children were starving, when their potato crop had failed. There were thousands of herrings within a mile of the shore, and a man might not take his boat out and catch the herrings, simply because of this preposterous law. It made such a strong impression on his colleagues and himself that they took the very unusual step of representing the facts to the Home Secretary, and telling him that if there were a famine in the Isle of Skye they washed their hands of all responsibility. He was happy to say that that abomination was cleared away and had never existed since, but it had made an indelible impression on his mind, and so long as he had the power to influence this matter in any way he would raise his

voice against the enactment of regulations which could not be shown to have any definite purpose, by which poor and industrious men were burdened and brought within the reach of the law and created offenders, fined and half ruined when no genuine ground could be shown for the law which had fined them. That appeared to be one of the worst forms of modern oppression. It was on that ground that he always ventured to advocate a most careful consideration of all laws and regulations with respect to fisheries, and he was extremely glad to find any one whose judgment he valued so highly and whose knowledge was equalled by that of very few persons now living, boldly coming forward and advocating the same cause. He begged to move a most hearty vote of thanks for the admirable paper he had read.

Mr. BURDETT-COUTTS, in seconding the motion, said he was sorry time did not admit of going somewhat at length into the important subject before them, but with regard to a waterside market he should like to point out one necessity which had been omitted, namely, that if the market were to be on the waterside it should be capable of being approached by vessels so constructed as to meet the requirements of stormy weather, in other words by large seaworthy vessels, carrying masts, and for that reason it would have to be below the bridges across the Thames. With regard to the proportion of water-borne fish, namely, 40,000 tons, as compared with 90,000 brought by land, he would also point out one peculiarity, namely, that the chief portion of fish brought by water was the cheaper kind, what was opprobriously called offal fish, though he strongly objected to such a word being used, especially considering that this kind of fish was eaten by 6000 people every week in the adjoining dining-room. At the same time

the prime fish, turbot, soles, and so on, were mostly brought by land. If in any way the transit of fish by water could be extended, one would extend in a corresponding proportion the food for the poorer classes of the Metropolis, and that seemed to him the important thing to do. With regard to Billingsgate, he did not wish to express any strong opinion, or to inquire into the reasons which led so many people to think that there was some artificial barrier which should not exist, but which did exist between the source of supply of this magnificent food and the consumers of it. It had been stated by a Billingsgate gentleman, to whom the Exhibition owed a great deal, and a member of the Executive Committee, that this large quantity of fish had been sold in Billingsgate day by day for $1\frac{1}{2}d.$, $1\frac{3}{4}d.$, and $2d.$ a lb. He could not stop to inquire into the reason, but he knew full well that none of that fish had reached the poor of London at that price, or anything like it. It was a new thing to a great number of the poor of London who came there and had a fish dinner for $6d.$, including bread and potatoes, and it was served in a much more expensive way than it would be necessary to serve it in their own homes; it was a new thing to become acquainted with these various kinds of cheap fish, and the reason for their ignorance was that they had no opportunities of purchasing them at a reasonable price throughout the Metropolis. He believed himself that this was caused mainly from the fault which Mr. Spencer Walpole had found with Billingsgate, namely, the want of approaches; but, wherever it was, there was a rising popular opinion, the mutterings he might almost say of a popular storm, which sooner or later, would be heard all over the Metropolis, and would insist on some improvement in the method of

distributing fish to the poor. One other remark he would make, which was almost forced upon him by a remark which fell from Mr. Bloomfield, and was also suggested by a portion of the speech of Mr. Walpole. He inveighed against the vice, as he might almost call it, of patronage, and he could not but think that his denunciation was somewhat sweeping. If in denouncing patronage he denounced merely careless charity, giving sums of money without exactly knowing the reasons or the objects for which they were given, or without tracing and following out the results which flowed from it, he was at one with him ; but if, as he gathered from his remarks, he was opposed to patronage in the shape of help, he could not agree with him. If patronage meant the holding out of the helping hand to men whom fortune and circumstances had deprived of that helping hand, and who had nowhere to look for it, then patronage was not only heavenly mercy, but also an economical good. He should like to explain exactly what the Baroness Burdett-Coutts had done with regard to Irish fisheries. She found a district about Cape Clear peopled by brave and hardy men risking their lives, day by day and night by night, in miserably small open boats, and they were struggling to compete with those men in whose interests Mr. Walpole had spoken, those experienced and tutored fishermen from the Isle of Man and Cornwall and other English coasts. When she heard of this she did not believe in the common notion of their want of business capacity, energy, and industry. She trusted them to this extent, that she procured for them boats, something like those used by fishermen of other parts, and she enabled some twelve or fifteen of these men to join together, and to have for each crew a thoroughly seaworthy boat. The boats were not

given to them, they were lent to them, and in each case a legal mortgage was executed. The only other charity was, that she did not charge them interest. This was three years ago, and in stating what the result was he could not but pay a passing tribute to one man in the district, the Rev. Father Davis, to whom a great part of the success of the experiment was due. Every half-year a balance sheet was presented to him, showing how the half-yearly instalments were paid off, and on the one presented last April there was not one single £1 in arrear, with the exception of one man who had suffered great misfortune owing to the storms, and was a little behindhand. With that exception the whole of these men had paid their instalments, and were on the high road to own these boats, and he believed the gentlemen who came from that district would bear him out in saying that to a certain extent the face of that small and at one time benighted district had been changed into a prosperous and healthy one.

Major HAYES (Inspector of Irish Fisheries) wished to add a word or two with regard to a statement made by Mr. Walpole regarding Irish fisheries. He had expressed regret that they were doing so little in Ireland—that the take per head only amounted to about one ton as compared with five or six tons in Scotland, and a somewhat greater proportion in England. Now he did not think the quantity of fish captured should be judged of in that way, because immense quantities were caught in Ireland, where there were no railways or steam communication, and this fish was carried through Ireland by “cadgers” or “jolters,” people with donkey-carts, who supplied the surrounding country. Again, in dealing with Scotch fisheries, he should point out that Irishmen fished the

coasts of Scotland ; they sent very large numbers of boats from the east coasts of Ireland to the west coast of Scotland, and these men joined in swelling the total of fish taken by Scotchmen. He assumed Mr. Walpole would not be acquainted with little details of this kind, but it was well known in Ireland that the fishermen regularly fished in Scotland, and some of them went down as far as Yarmouth. They might look forward with great hope to the future of the fishermen of Ireland, for it was stated in the annual report issued a short time back, that whereas the mackerel and herring fishing-boats had increased on the part of the Isle of Man, Scotland and England about 50 per cent., these large and improved boats had increased 100 per cent. in Ireland within the last seven or eight years. Although an Irish official, he was not an Irishman, but he felt bound to stand up and say that he believed they were going a-head. He did not think they were looking for charity in Ireland. On the west coast they had laboured under a great disadvantage for many years, in fact always from the want of harbours, and a Bill was now before Parliament, not to give money from the Exchequer, but to give money which belonged to the Irish Church for this purpose, and he had been summoned to London for the purpose of giving evidence on the subject, and he could only say he had given the Bill the strongest support he possibly could, because he was satisfied that without proper harbour accommodation on the west coast, they could have no hope for any great increase there of the large high-class fishing vessels such as were found in the Isle of Man and Scotland.

The CHAIRMAN, in putting the resolution, said Mr. Walpole had proved to demonstration that very high charges, and without saying anything disrespectful to railway

directors, unreasonable charges were made for the transit of fish by railway. That was a matter to which public attention would, he hoped, be more and more directed, and that railway directors would see it to their interest to do something to promote the cheaper transit of fish to the London market. He had also referred to the somewhat vexed question of the London market, which had also been referred to by Mr. Burdett-Coutts and Mr. Sayer. He thought it only right to say, that as far as he had been able to judge, and during the last year he had some little opportunity of judging, he did not think the Billingsgate salesmen deserved the harsh things that were sometimes laid to their charge, for he believed they were, as a whole, an honourable body of men. Billingsgate was, after all, only the wholesale market; it was in a most difficult and incommodious situation as regarded the narrow streets by which it was surrounded; but surely the Billingsgate salesmen were not responsible for the width of those streets and the deficiency of access. The market was an open market, any one might go and purchase there, and though, no doubt, there was a great deficiency of markets where the poor could obtain their supplies, it would be hard on the Billingsgate salesmen to lay that to their charge. He hoped the question would be treated fairly and candidly, that no undue regard to vested interests would prevent the Corporation from doing what might be their duty with regard to providing suitable access to their own market, and that the Billingsgate salesmen would be willing to meet, as far as possible, the public demands, and that all might be done in a kindly and friendly spirit, in order to accomplish the object which they all desired, namely, the supplying of the poor of London with fish at a lower rate than heretofore.

The vote of thanks having been carried unanimously,

Mr. SPENCER WALPOLE, in reply, said there were only one or two remarks which it was necessary to comment on. With respect to the question put to him by Mr. Cayley, whether the paragraph with reference to the construction of a market twenty miles from London had been inserted with his sanction, he would only say that he was not aware that anything he had ever said or written conveyed any sanction of the kind ; and if Mr. Cayley asked him whether he should approve of such a position, he should feel utterly incompetent to give any opinion until he saw the exact spot on which it was intended to place the market, and the conveniences of access to it. He was a little at a loss to understand some of Mr. Bloomfield's criticisms, but, as far as he could follow him, they were both working in exactly the same direction. Mr. Bloomfield complained that the railway rates were excessive, in which he agreed with him, but he (Mr. Walpole) suggested that the true way of dealing with excessive rates was to provide adequate competition ; and if he might be allowed to translate a line in Horace, he would say, "If he knows a better way, let him tell it ; but if not, use this method with me." He knew of no better mode than by trying to provide competition ; he did not suppose even Mr. Bloomfield would suggest that the State itself should provide steamers to carry the fish from Skibbereen. With respect to the remarks which had fallen from Mr. Burdett-Coutts, and which had been partly seconded by his friend Major Hayes, he would say a few words. He should be very sorry if in anything he had said to-day he was thought to display any want of sympathy with Ireland or Irish fishermen. He ventured to say there was no person in the room, Irish or English, who felt more deeply for the

woes of Ireland than he did. What he had said about patronage he said designedly, and he would endeavour to make good some of his words. He was far from criticising the wisdom of the policy which Lady Burdett-Coutts was carrying out. He should be the first to acknowledge the wise and bountiful charity of that excellent lady, and he might say that he had a double interest in thanking her for what she had done, because she had had the extreme wisdom to go to the Isle of Man, where she was purchasing the boats she was sending to Ireland. But, if he might take a case from another country where no feeling would be mixed up with the argument, he would endeavour to show what he meant. The Germans, like the Irish, were endeavouring to develop their fisheries, and he would state what was going on in Germany. A society in Germany had built for German fishermen a fleet of twelve large vessels to fish in the North Sea. One of those vessels had been lost—it was lost some years ago—and, when he looked into the matter, it had never been replaced. The other eleven vessels lay most of the year idle at Emden, whilst, notwithstanding that the German Government imposed heavy protective duties to keep out Scotch, Norwegian and Dutch herrings, the whole of the German markets were now supplied, not by the vessels which the Germans had built, but by the Scotch, Norwegian, and Dutch fishermen. That was an instance to prove that industries which did not flourish of their own selves would not flourish because some one wished them to do so. He was one of those old-fashioned people who could not get out of his head that an industry which was worth having must be one that took its own root and grew by its own effort. You might grow a plant in the heated air of a hothouse, but it would never flourish like

to whom he had taken somewhat the semblance of a red rag to a bull, so that whatever discussion he had happened to be present at until this one, there had been a vehement outburst of objection to the doctrine of not interfering when you did not know what you were about, which he had ventured to broach, and which seemed to him the simplest and most straightforward doctrine in the world. He should be glad to say a word on this topic, having by accident been absent on the previous day, when Mr. Shaw-Lefevre read a paper, though it was doing what he himself deprecated, dealing with a matter which was not exactly the one before the Conference. What he wished to say was this, that he did not come to the conclusion which he had advocated now for so many years, on the sort of grounds that actuated a *doctrinaire* man of science ; on the contrary, nothing could be more distinctly and emphatically practical than the reasons which first impressed on his mind the impolicy which existed twenty-five years ago, and which he was happy to think, with the help of his colleague, Sir James Caird, and Mr. Shaw-Lefevre, he had some hand in getting rid of. He would mention an occurrence which made an indelible impression on his mind. When he and his colleagues visited the Isle of Skye, the worst part of Ireland, that which was in the most depressed state, could not show a population in greater misery than the people who were to be seen within a mile and a half of Portreath. He had journeyed in many parts of the world and seen many savage people, but the population of New Guinea, about which they had heard so much lately, and where he had been a great many years, was vastly better provided with the comforts, decencies, and refinements of life than many of their fellow-subjects in the Isle of Skye were twenty years ago. He should imagine that

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voice against the enactment of regulations which could not be shown to have any definite purpose, by which poor and industrious men were burdened and brought within the reach of the law and created offenders, fined and half ruined when no genuine ground could be shown for the law which had fined them. That appeared to be one of the worst forms of modern oppression. It was on that ground that he always ventured to advocate a most careful consideration of all laws and regulations with respect to fisheries, and he was extremely glad to find any one whose judgment he valued so highly and whose knowledge was equalled by that of very few persons now living, boldly coming forward and advocating the same cause. He begged to move a most hearty vote of thanks for the admirable paper he had read.

Mr. BURDETT-COUTTS, in seconding the motion, said he was sorry time did not admit of going somewhat at length into the important subject before them, but with regard to a waterside market he should like to point out one necessity which had been omitted, namely, that if the market were to be on the waterside it should be capable of being approached by vessels so constructed as to meet the requirements of stormy weather, in other words by large seaworthy vessels, carrying masts, and for that reason it would have to be below the bridges across the Thames. With regard to the proportion of water-borne fish, namely, 40,000 tons, as compared with 90,000 brought by land, he would also point out one peculiarity, namely, that the chief portion of fish brought by water was the cheaper kind, what was opprobriously called offal fish, though he strongly objected to such a word being used, especially considering that this kind of fish was eaten by 6000 people every week in the adjoining dining-room. At the same time

the prime fish, turbot, soles, and so on, were mostly brought by land. If in any way the transit of fish by water could be extended, one would extend in a corresponding proportion the food for the poorer classes of the Metropolis, and that seemed to him the important thing to do. With regard to Billingsgate, he did not wish to express any strong opinion, or to inquire into the reasons which led so many people to think that there was some artificial barrier which should not exist, but which did exist between the source of supply of this magnificent food and the consumers of it. It had been stated by a Billingsgate gentleman, to whom the Exhibition owed a great deal, and a member of the Executive Committee, that this large quantity of fish had been sold in Billingsgate day by day for $1\frac{1}{2}d.$, $1\frac{3}{4}d.$, and $2d.$ a lb. He could not stop to inquire into the reason, but he knew full well that none of that fish had reached the poor of London at that price, or anything like it. It was a new thing to a great number of the poor of London who came there and had a fish dinner for $6d.$, including bread and potatoes, and it was served in a much more expensive way than it would be necessary to serve it in their own homes; it was a new thing to become acquainted with these various kinds of cheap fish, and the reason for their ignorance was that they had no opportunities of purchasing them at a reasonable price throughout the Metropolis. He believed himself that this was caused mainly from the fault which Mr. Spencer Walpole had found with Billingsgate, namely, the want of approaches; but, wherever it was, there was a rising popular opinion, the mutterings he might almost say of a popular storm, which sooner or later, would be heard all over the Metropolis, and would insist on some improvement in the method of

distributing fish to the poor. One other remark he would make, which was almost forced upon him by a remark which fell from Mr. Bloomfield, and was also suggested by a portion of the speech of Mr. Walpole. He inveighed against the vice, as he might almost call it, of patronage, and he could not but think that his denunciation was somewhat sweeping. If in denouncing patronage he denounced merely careless charity, giving sums of money without exactly knowing the reasons or the objects for which they were given, or without tracing and following out the results which flowed from it, he was at one with him ; but if, as he gathered from his remarks, he was opposed to patronage in the shape of help, he could not agree with him. If patronage meant the holding out of the helping hand to men whom fortune and circumstances had deprived of that helping hand, and who had nowhere to look for it, then patronage was not only heavenly mercy, but also an economical good. He should like to explain exactly what the Baroness Burdett-Coutts had done with regard to Irish fisheries. She found a district about Cape Clear peopled by brave and hardy men risking their lives, day by day and night by night, in miserably small open boats, and they were struggling to compete with those men in whose interests Mr. Walpole had spoken, those experienced and tutored fishermen from the Isle of Man and Cornwall and other English coasts. When she heard of this she did not believe in the common notion of their want of business capacity, energy, and industry. She trusted them to this extent, that she procured for them boats, something like those used by fishermen of other parts, and she enabled some twelve or fifteen of these men to join together, and to have for each crew a thoroughly seaworthy boat. The boats were not

given to them, they were lent to them, and in each case a legal mortgage was executed. The only other charity was, that she did not charge them interest. This was three years ago, and in stating what the result was he could not but pay a passing tribute to one man in the district, the Rev. Father Davis, to whom a great part of the success of the experiment was due. Every half-year a balance sheet was presented to him, showing how the half-yearly instalments were paid off, and on the one presented last April there was not one single £1 in arrear, with the exception of one man who had suffered great misfortune owing to the storms, and was a little behindhand. With that exception the whole of these men had paid their instalments, and were on the high road to own these boats, and he believed the gentlemen who came from that district would bear him out in saying that to a certain extent the face of that small and at one time benighted district had been changed into a prosperous and healthy one.

Major HAYES (Inspector of Irish Fisheries) wished to add a word or two with regard to a statement made by Mr. Walpole regarding Irish fisheries. He had expressed regret that they were doing so little in Ireland—that the take per head only amounted to about one ton as compared with five or six tons in Scotland, and a somewhat greater proportion in England. Now he did not think the quantity of fish captured should be judged of in that way, because immense quantities were caught in Ireland, where there were no railways or steam communication, and this fish was carried through Ireland by “cadgers” or “jolters,” people with donkey-carts, who supplied the surrounding country. Again, in dealing with Scotch fisheries, he should point out that Irishmen fished the

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Why is the economic condition of fishermen generally unsatisfactory? Partly from economic reasons, and partly from faults inherent in the fishermen themselves. In the first instance, too many men and women are employed in the fisheries in proportion, at least, to the amount of production; or, better still, there are too many idle men, so-called fishermen, who had better abandon their calling than cumbering the ground with their lazy habits. Fishing is a favourite occupation in this country. The sea is the natural resort of the Briton. Born on the shore of his island home, he plunges into it from infancy, for health and pleasure. With navigation as a necessity, and with all his impulses towards countries beyond the sea, the Briton learns as he grows to defy its dangers, and ride on its storms. And so it happens, as Adam Smith said, "that when the natural taste for certain employments makes more people follow them than can live comfortably by them, the produce of their labour, in proportion to its quantity, comes always too cheap to market to afford anything but the most scanty subsistence to the labourers." As I have already shown in my preface to the Catalogue, there are in the United Kingdom about 120,000 persons constantly or occasionally employed in fishing, who, with their dependents, may be taken to represent upwards of 500,000 persons. And the total annual value of the British fisheries is estimated at over £11,000,000, giving an average produce per head of about £22. In agricultural pursuits there are employed about 3,300,000 persons, and they raise annually produce to the value of about £270,000,000, giving an average of about £82 per head; that proportion being considerably

exceeded in the manufacturing industry, which is so greatly aided by mechanical contrivances and the use of steam. When an occupation is pursued for pleasure it matters not how many are engaged in it, but when it is followed from necessity, it makes all the difference when too large a number of men, women and children are depending on its results. The exact number of persons employed in the fisheries is not easily ascertainable, many combining other occupations with that of fishing. But the Commissioners of Customs, in their annual Statement of the Navigation and Shipping of the United Kingdom for the year 1882, gave the number, approximately, as follows :—

Countries.	Number of Men and Boys constantly employed in Fishery, resident within the limits of the Port.	Number of Persons, other than regular Fishermen, occasionally employed in Fishing.	Total.
England	30,802	12,798	43,600
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A very large proportion of the boats in which fishermen pursue their calling is of very small burthen. In England and Scotland three-fifths, and in Ireland nine-tenths of the boats are of the second and third class, that is, of from one to four tons burthen, and of very small dimensions.

There has been some improvement in the last ten years in the fishing boats, but much remains to be accomplished. (See Appendix A.) The number and tonnage of fishing boats registered in the United Kingdom in 1871 and 1881 were as follows :—

Class.	1871.			1881.		
	Number of Boats.	Tons.	Average Tonnage per Boat.	Number of Boats.	Tons.	Average Tonnage per Boat.
Boats of 15 tons and upwards, 1st class . . .	5,248	139,197	26·0	8,397	254,978	30·0
Boats of less than 15 tons, 2nd class . . .	23,927	105,987	4·42	18,335	82,259	4·74
Boats 3rd class . . .	9,960	15,081	1·52	6,690	11,768	1·75
Total known . . .	39,135	260,265	6·64	32,422	349,005	10·41

§ 6.—PROPORTION OF MEN TO BOATS.

Comparing the number of boats with the number of men, in so far as concerns the boats, the certificates of which were endorsed in the year 1882, the proportions were as follows :—

Countries.	Number of Boats.	Number of Men and Boys.	Number per Boat.
England	6,289	27,512	4·38
Scotland	9,249	42,566	4·59
Ireland	5,550	20,434	3·68
	21,088	90,512	4·28

The proportion of men to a boat does not seem very large, but when compared to tonnage it is found excessive.

In the merchant marine, with 6,715,000 tons, there were employed, in 1882, 195,937 men, or in the proportion of 2·92 persons per 100 tons. In fishing, with 349,000 tons, there were employed about 120,000 men, or in the proportion of 34 persons per 100 tons.

§ 7.—CAPITAL EMPLOYED IN FISHING—FIXED AND FLOATING.

A considerable amount of capital is invested in the British fisheries. Assuming £10 per ton as the value of the fishing boats, exclusive of the large ships employed in the whale and seal fisheries, and other £10 * per ton for gear, nets, &c., the 350,000 tons employed would represent £7,000,000 of capital, while £3,000,000 more may be taken as the capital invested in all the processes of curing, preserving, &c., making in all £10,000,000. Add to this £3,000,000 wages, and we have a sum total of £13,000,000 capital employed in the fisheries of the United Kingdom, in the proportion of three-fourths fixed and one-fourth floating. In the cotton manufacture the capital employed is estimated at about £90,000,000, of which £60,000,000 is fixed and £30,000,000 floating, or in the proportion of about two-thirds and one-third respectively. True, the profits of the fixed capital are divided in the fisheries among the fishermen themselves in a much larger number of cases than among those employed in the cotton manufacture; but any advantage the fishermen derive from this source is more than counterbalanced by the uncertain character of their profits from the floating capital.

* Whaling ships are usually insured at over £30 a register ton, which includes stores and valuable fishing gear. A whaler, 315 tons, was valued £13,500. Another, 255 tons, was valued £11,500.

§ 8.—PRECARIOUS CHARACTER OF FISHING AND AGRICULTURE COMPARED.

The great element which operates against the fishing industry, and especially against individual fishermen, is the precariousness and uncertainty of the result of their labour. It is beyond question that fishing is both fitful and irregular. "The herring fishery," said Mr. Bertram in his interesting work 'Harvest of the Sea,' "is best described when it is called a lottery. No person knows what the yield will be till the last moment; it may be abundant, or it may be a total failure. Agriculturists are aware, long before the reaping season, whether their crops are light or heavy, and they arrange accordingly; but, if we are to believe the fisherman, his harvest is entirely a matter of luck." Whilst admitting that considerable uncertainty exists in the success of each boat separately, it does not appear that anything like the same uncertainty obtains as regards the entire catch from year to year. Nor, if we compare the total results of the harvest of the sea with the total results of the harvest of land, do we find the amount of uncertainty to be much greater in the one than in the other. The following comparison of the total product of the herring fishery, and of the number of bushels of wheat per acre produced in England and Wales during the twenty years from 1861 to 1880, shows that, taking the average of the entire period as the standard of 100, whilst the range of variation in the herring fishery was 188, the range of variation in the production of wheat was 183. If we take, however, the number of crans per boat caught on an average at Wick in the same twenty years, we find the range of variation, based upon the standard of 100, to have been 223, instead

of 183 as in the case of the production of wheat. The facts were as follows :—

Years.	FISHERIES.				AGRICULTURE.	
	Total Product of Herring Fishery. Number of Barrels cured.	Comparison with average of 20 years as 100.	Average catch at Wick. Number of Crans per Boat.	Comparison with average of 20 years as 100.	Production of Wheat, England, and Wales. Number of Bushels per Acre.	Comparison with average of 20 years as 100.
1861	651,000	81	87	95	25·6	94
1862	797,000	99	82	91	30·4	112
1863	609,000	76	83	92	39·2	145
1864	609,000	76	90	97	35·2	130
1865	601,000	75	76	84	29·6	108
Average } 5 years	653,000	80	83	92	32·0	117
1866	645,000	80	64	70	25·6	95
1867	804,000	100	83	91	20·8	77
1868	638,000	79	42	46	34·4	127
1869	675,000	84	80	88	28·8	106
1870	833,000	104	78	86	31·2	115
Average } 5 years	719,000	89	69	75	28·1	104
1871	825,000	103	114	125	25·6	94
1872	774,000	96	66	74	25·6	94
1873	939,000	117	108	119	22·4	83
1874	1,000,000	125	95	104	29·6	109
1875	943,000	118	100	109	21·6	80
Average } 5 years	896,000	111	96	106	24·9	92
1876	598,000	74	88	96	21·6	80
1877	848,000	106	69	75	20·8	77
1878	906,000	113	145	159	30·4	112
1879	842,000	105	106	116	16·0	59
1880	1,474,000	184	173	190	25·6	92
Average } 5 years	933,000	116	116	127	22·8	84
Average } of 20 years 1861- 1880	800,000	100	91	100	26·9	100

QUINQUENNIAL RANGE OF VARIATIONS.

Periods.	Total Herring Fishery.			Number of Crans per Boat, Wick.			Agriculture.		
	Mini- mum.	Maxi- mum.	Range.	Mini- mum.	Maxi- mum.	Range.	Mini- mum.	Maxi- mum.	Range.
1861-65	75	99	24	84	99	15	94	145	51
1866-69	79	104	25	46	91	45	77	127	50
1870-75	96	125	29	66	114	48	80	109	29
1876-80	74	184	110	75	190	115	59	112	53
			188			223			153

The same facts, exhibited graphically as in the Diagram on the next page, are still more striking, as they indicate in a remarkable manner the different fortunes of the fisheries and agriculture in the last twenty years.



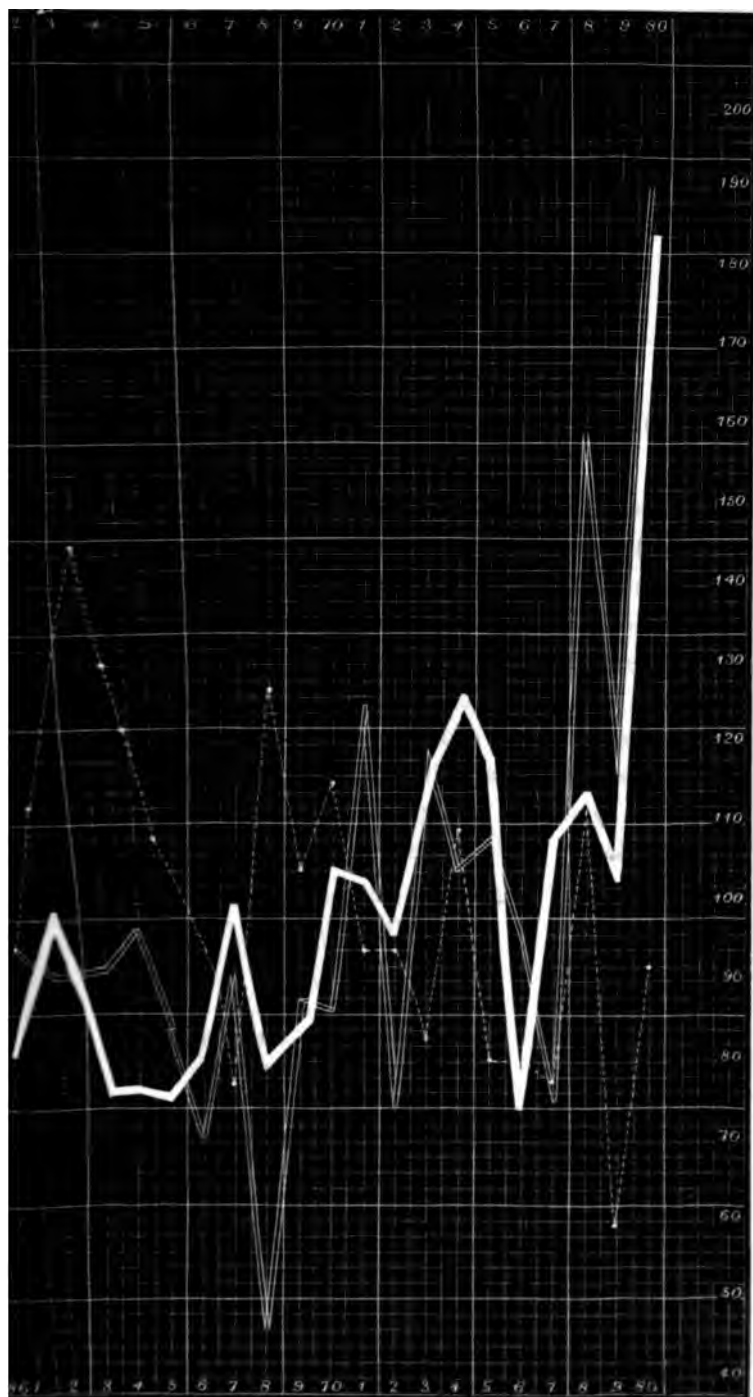
Total product of Herring Fishery. Number of barrels cured.

Average catch at Wick. Number of crans per boat.

Production of Wheat in England. Number of bushels per acre.

Standard of 100, based on the average production for the 20 years.

Commencing pretty nearly at the same level in 1861, we find agriculture prospering for several years, whilst the fisheries were declining. Following an almost opposite course, from year to year, the apparent competition ended with the fisheries being very high and agriculture very low. The year 1881 was disappointing for both land and sea, and 1882 did not give better results for either. In comparing the different fortunes of agriculture and fisheries, it must be borne in mind that, whereas in agriculture the losses from bad harvests press mostly on landowners and farmers, agricultural labourers being in the receipt of weekly wages, in the case of the fisheries the losses are borne in due proportion by the fishermen. In their case the lament "We have toiled all night, and have caught



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nothing," has a sad personal significance. It means no food in the house and no money to pay house-rent. Most heartily, then, do we join in the prayer—

"O weel may the boatie row,
And better may she speed,
And muckle luck attend the boat
That wins the bairnies' bread."

§ 9.—THE ELEMENT OF "LUCK" IN FISHING ADVENTURES.

Providence, luck, or chance, by whatever name it may be called, is an element ever-present in every industry, but more especially in that of fishing. The abundance or scarcity of fish at any season, the special direction of their periodical migrations, the presence of the boat at a special spot just when the light of the moon is waning, or the meeting of a sudden gale, or any accident, causing the destruction or injury of the nets, these are events quite beyond the power of care and prudence to avert or regulate. With Metastasio, we may say :

"Nel cammin di nostra vita,
Senza i rai del Ciel cortese,
Si smarrisce ogn' alma ardita,
Trema il cuor, vacilla il piè.
A compir le belle imprese,
L'arte giova, il senno ha parte,
Ma vaneggia il senno e l'arte,
Quando amico il Ciel non è."

"In passing along the path of life, unless we have the light of Heaven shed upon us, every bold spirit is seized with dismay—the heart fails and the feet falter. To accomplish some lofty object skill and judgment may lend their aid, but skill and judgment are but vain, if Heaven be not our friend." Depend on it, however, that in fishing as in

every other industry, success depends on ourselves much more than on luck or chance. It is skill, activity, promptitude of action, and perseverance, that in the end win the day, and it is vain to make ill-luck responsible for what comes from carelessness or ignorance.

**§ 10.—RELATIONS BETWEEN BOAT-OWNERS, CURERS,
AND FISHERMEN.**

The conditions under which fishermen pursue their calling differ considerably in the fishing ports. In Hull, the custom is to divide the proceeds by eighths, according to the scale, by averages; the skipper taking so many, the mate so many, and the men so many, they again paying for their provisions in similar proportions. At Lowestoft the general practice is for fishermen to be joint adventurers with the owner. The owner gives the boat, gear, and net, and fishermen give their labour. At the end of the fishing the accounts are settled. Out of the gross proceeds the expenses of the boat, food of fishermen, salt, commission, &c., are first deducted, and of the net proceeds the half goes to the owner, a share is taken for the boat, a half share for the net, and the remainder is divided among the master and fishermen, according to their position in the boat. At Yarmouth the proceeds are divided into six parts, and each participates in so many sixths. In some parts of Ireland the owner of the boat takes half, keeps the boat in repair, and supplies the net, the other half being divided among the men in equal shares. In Scotland, the curers engage fishermen at a fixed price per cran of herrings, and pay them £10, £20, or £30, as the case may be, as bounty, the advance constituting a debt against the fishermen.

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Why is the economic condition of fishermen generally unsatisfactory? Partly from economic reasons, and partly from faults inherent in the fishermen themselves. In the first instance, too many men and women are employed in the fisheries in proportion, at least, to the amount of production; or, better still, there are too many idle men, so-called fishermen, who had better abandon their calling than cumbering the ground with their lazy habits. Fishing is a favourite occupation in this country. The sea is the natural resort of the Briton. Born on the shore of his island home, he plunges into it from infancy, for health and pleasure. With navigation as a necessity, and with all his impulses towards countries beyond the sea, the Briton learns as he grows to defy its dangers, and ride on its storms. And so it happens, as Adam Smith said, "that when the natural taste for certain employments makes more people follow them than can live comfortably by them, the produce of their labour, in proportion to its quantity, comes always too cheap to market to afford anything but the most scanty subsistence to the labourers." As I have already shown in my preface to the Catalogue, there are in the United Kingdom about 120,000 persons constantly or occasionally employed in fishing, who, with their dependents, may be taken to represent upwards of 500,000 persons. And the total annual value of the British fisheries is estimated at over £11,000,000, giving an average produce per head of about £22. In agricultural pursuits there are employed about 3,300,000 persons, and they raise annually produce to the value of about £270,000,000, giving an average of about £82 per head; that proportion being considerably

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the percentage on oil, skins, &c. For nine months their earnings would be £26 for each man. In the Report of the Committee appointed to inquire into the Sea Fishing Trade, there is an account of a settlement or fishing voyage in 1881. Out of a gross produce of £551, and a net stock of £397, the people's part, divided in shares, was £174, or £18 15s. 6d. each. From various accounts which I had the opportunity of examining, the net share falling on the fishermen may be taken at 30 per cent. of the total gross amount. To this sum, however, there must be added the cost of the food of fishermen whilst engaged in fishing, but we must deduct from the amount the portion of loss for gear and net charged on them, as well as the cost of the fishermen's dress and equipment. In plain figures, the account may approximately be put down as follows:—

30 per cent. to fishermen of £11,000,000 gross produce	} 3,300,000
Food of fishermen, 80,000 for 9 months at 8s. a week, say £16 each	} 1,000,000
	4,300,000
Deduct 10 per cent. for share of loss of gear, clothing, &c.	} 500,000
	3,800,000

Divide this amount by 120,000, and we have an average of £31 13s. per annum each, or 12s. per week. But the £1,000,000 calculated as the cost of the fisherman's board does not come home to the family. The share really falling to the fisherman's family, to support four or five persons, is £3,300,000, less £500,000, or £2,800,000, or £23 per family, or about 9s. per week.* To this, doubtless, there

* This actual expenditure of a fisherman's family, consisting of father, mother, three sons and daughter, aged respectively 8, 10, 12 and 14 years, in

must be added any supplementary income from other sources. A small croft, an occasional employment in a ship as sailor, the allowance from the Naval Reserve, where it can be had, all help, only such extra income is very uncertain ; it is not shared in by all fisherfolk, and, in any case, it is small, and cannot essentially alter the economic condition of our fishermen.

§ 13.—COST OF TRANSPORT AND OTHER CHARGES.

I said at the commencement of my paper, that of the gross value of the fisheries, but little remains for the fishermen themselves, the expenses of transport and the cost of distribution being exceedingly heavy. A large portion of fish, about 200,000 tons a year, is now conveyed by railway, but the rates charged are in many

Newhaven, near Edinburgh, has been ascertained to have been in one year about as follows :

EXPENDITURE.			
	£	s.	d.
Rent	8	0	0
Rates	0	17	0
Fire and Light	4	5	0
Groceries	31	4	0
Meat	15	12	0
Fish.	6	10	0
Milk	6	10	0
Drink			
Clothing	12	0	0
Boots and Shoes	4	0	0
Amusements	1	10	0
Education	2	12	0
Church	2	10	0
Doctor's Bill	1	0	0
	96	10	0

This scale of expenditure is, however, I fear, too high to indicate the average expenditure of fishermen's families in the United Kingdom. Nothing is, moreover, put down for drink.

QUINQUENNIAL RANGE OF VARIATIONS.

Periods.	Total Herring Fishery.			Number of Crans per Boat, Wick.			Agriculture.		
	Minimum.	Maximum.	Range.	Minimum.	Maximum.	Range.	Minimum.	Maximum.	Range.
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1866-69	79	104	25	46	91	45	77	127	50
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			188			223			163

The same facts, exhibited graphically as in the Diagram on the next page, are still more striking, as they indicate in a remarkable manner the different fortunes of the fisheries and agriculture in the last twenty years.



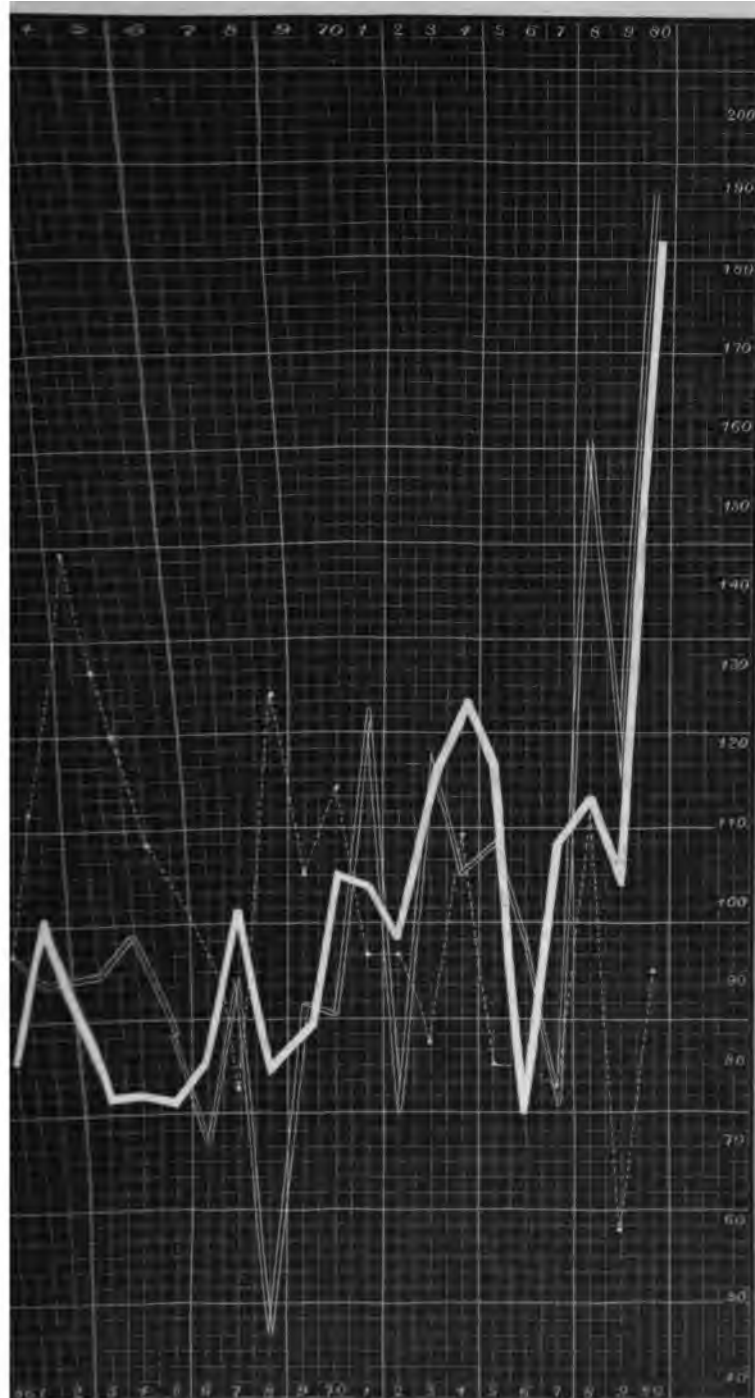
Total product of Herring Fishery. Number of barrels cured.

Average catch at Wick. Number of crans per boat.

Production of Wheat in England. Number of bushels per acre.

Standard of 100, based on the average production for the 20 years.

Commencing pretty nearly at the same level in 1861, we find agriculture prospering for several years, whilst the fisheries were declining. Following an almost opposite course, from year to year, the apparent competition ended with the fisheries being very high and agriculture very low. The year 1881 was disappointing for both land and sea, and 1882 did not give better results for either. In comparing the different fortunes of agriculture and fisheries, it must be borne in mind that, whereas in agriculture the losses from bad harvests press mostly on landowners and farmers, agricultural labourers being in the receipt of weekly wages, in the case of the fisheries the losses are borne in due proportion by the fishermen. In their case the lament "We have toiled all night, and have caught



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nothing," has a sad personal significance. It means no food in the house and no money to pay house-rent. Most heartily, then, do we join in the prayer—

"O weel may the boatie row,
And better may she speed,
And muckle luck attend the boat
That wins the bairnies' bread."

§ 9.—THE ELEMENT OF "LUCK" IN FISHING ADVENTURES.

Providence, luck, or chance, by whatever name it may be called, is an element ever-present in every industry, but more especially in that of fishing. The abundance or scarcity of fish at any season, the special direction of their periodical migrations, the presence of the boat at a special spot just when the light of the moon is waning, or the meeting of a sudden gale, or any accident, causing the destruction or injury of the nets, these are events quite beyond the power of care and prudence to avert or regulate. With Metastasio, we may say :

"Nel cammin di nostra vita,
Senza i rai del Ciel cortese,
Si smarrisce o:n' alma ardita,
Trema il cuor, vacilla il piè.
A compir le belle imprese,
L'arte giova, il senno ha parte,
Ma vaneggia il senno e l'arte,
Quando amico il Ciel non è."

"In passing along the path of life, unless we have the light of Heaven shed upon us, every bold spirit is seized with dismay—the heart fails and the feet falter. To accomplish some lofty object skill and judgment may lend their aid, but skill and judgment are but vain, if Heaven be not our friend." Depend on it, however, that in fishing as in

every other industry, success depends on ourselves much more than on luck or chance. It is skill, activity, promptitude of action, and perseverance, that in the end win the day, and it is vain to make ill-luck responsible for what comes from carelessness or ignorance.

**§ 10.—RELATIONS BETWEEN BOAT-OWNERS, CURERS,
AND FISHERMEN.**

The conditions under which fishermen pursue their calling differ considerably in the fishing ports. In Hull, the custom is to divide the proceeds by eighths, according to the scale, by averages; the skipper taking so many, the mate so many, and the men so many, they again paying for their provisions in similar proportions. At Lowestoft the general practice is for fishermen to be joint adventurers with the owner. The owner gives the boat, gear, and net, and fishermen give their labour. At the end of the fishing the accounts are settled. Out of the gross proceeds the expenses of the boat, food of fishermen, salt, commission, &c., are first deducted, and of the net proceeds the half goes to the owner, a share is taken for the boat, a half share for the net, and the remainder is divided among the master and fishermen, according to their position in the boat. At Yarmouth the proceeds are divided into six parts, and each participates in so many sixths. In some parts of Ireland the owner of the boat takes half, keeps the boat in repair, and supplies the net, the other half being divided among the men in equal shares. In Scotland, the curers engage fishermen at a fixed price per cran of herrings, and pay them £10, £20, or £30, as the case may be, as bounty, the advance constituting a debt against the fishermen.

This method is specially noticed by Mr. Bertram as decidedly objectionable. The bargain, it appears, is, that the curer will take, say, two hundred crans of herrings certain, and pay for them at so much per cran to a boat-owner, giving him an advance on the same. The boat-owner again, on his side, has to provide the boat, nets, buoys, and all the apparatus of the fishery, and he engages a crew to fish, usually hired men, who get so much wages at the end of the season, and have no risk or profit. The bargain is made at one season for another ; so that, in anticipation of the result, the curer pays the bounty and makes the necessary preparations in providing barrels, salt, and other necessities for the cure, and the boat-owner receives his pay, one year in advance, for next year's work. In the same manner curers will advance money to young fishermen, in order that they may purchase a boat and the necessary quantity of netting. The whole system, says Mr. Bertram, is decidedly unhealthy. The money is, in fact, spent in advance ; and, if the season happens to be unfavourable, the consequence is necessarily disastrous to all. In every way the present system works badly. Wherever the fisherman's pay depends on the proceeds of the adventure, it is not till the end of the season that his share can be ascertained, and since seldom any money is advanced to the fisherman's wife and family, they are compelled to live on credit all the year round. If, at the end of the season, the fisherman succeeds in saving something, and is considerate enough to bring it home to his family, well and good ; the money due, or portion of it, is paid to the shopkeepers. If, however, the fisherman happens to be unsuccessful, and he brings nothing home, then the debt swells to such an extent that the patience of the shopkeeper is exhausted, and charity or starvation

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relations between employers and employed, unless they are both made to feel that they have an immediate and direct interest in the success of the work in which they are engaged." On the other hand, it is well known that whatever success may have attended co-operative societies for distribution, the same has not been the case as respects co-operative societies for production. And, under all circumstances, it is doubtless an evil that men who have nothing whatever to lose, men who depend for their daily bread upon the success of their work, should be made to share with the owners in all the risks of a necessarily most hazardous adventure. To my mind it would be much better to relieve our fishermen from a responsibility which they have not the strength to bear, and it would be wiser on their part to be content to work for wages, especially with the addition of a percentage of the profits of the adventure. This is the method provided for by the Partnership Amendment Act,* which declared that the receipt of a share of the profits, or of a payment contingent upon, or varying with the profits of any business shall not of itself make the person receiving the share or payment a partner with the person carrying on the business. And this, in reality, was the substance of the partnership en commandite, as first pursued in the Middle Ages. It was the custom in those days to trust the rearing and disposing of flocks and herds, or a sum of money, or a venture of merchandise, with another, giving him a certain interest in the profits, the bailor not being responsible for more than the sum intrusted, whilst the management of the business vested in the bailee. The bailor was called the commanditaire, the bailee the commandité, and the contract

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What is the present amount of earnings of fishermen it is difficult to estimate. Where they are paid by fixed wages the rates are usually 15s. and even 20s. a week, but such wages can only be reckoned upon for a few months in the year. Where fishermen share in the profits, the income varies considerably. In all cases, nine months' labour is the most that the fisheries afford, whilst those not constantly but occasionally employed in fishing must reckon upon still less employment; and, though there is something to do in connection with the fisheries for women and children, the earnings of these are usually very slender. From information received,* I find that a crew of seal and whale fishing, consisting of fifty-one men besides the captain, received on average £2 18s. per month, besides

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30 per cent. to fishermen of £11,000,000 gross produce	£ 3,300,000
Food of fishermen, 80,000 for 9 months at 8s. a week, say £16 each	1,000,000
	4,300,000
Deduct 10 per cent. for share of loss of gear, clothing, &c.	500,000
	<u>3,800,000</u>

Divide this amount by 120,000, and we have an average of £31 13s. per annum each, or 12s. per week. But the £1,000,000 calculated as the cost of the fisherman's board does not come home to the family. The share really falling to the fisherman's family, to support four or five persons, is £3,300,000, less £500,000, or £2,800,000, or £23 per family, or about 9s. per week.* To this, doubtless, there

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§ 13.—COST OF TRANSPORT AND OTHER CHARGES.

I said at the commencement of my paper, that of the gross value of the fisheries, but little remains for the fishermen themselves, the expenses of transport and the cost of distribution being exceedingly heavy. A large portion of fish, about 200,000 tons a year, is now conveyed by railway, but the rates charged are in many

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EXPENDITURE.			
	£	s.	d.
Rent	8	0	0
Rates	0	17	0
Fire and Light	4	5	0
Groceries	31	4	0
Meat	15	12	0
Fish.	6	10	0
Milk	6	10	0
Drink			
Clothing	12	0	0
Boots and Shoes	4	0	0
Amusements	1	10	0
Education	2	12	0
Church	2	10	0
Doctor's Bill	1	0	0
	96	10	0

This scale of expenditure is, however, I fear, too high to indicate the average expenditure of fishermen's families in the United Kingdom. Nothing is, moreover, put down for drink.

cases prohibitory. The Committee of the House of Commons on the Charges of Railway Companies in 1882, reported, "that witnesses from Forfarshire and from Cornwall informed them that the rates now charged for fish and vegetables absorb so large a portion of the price realised as to leave a comparatively small margin for production, and that when the supply is plentiful, the whole of the proceeds is sometimes absorbed by the carriage and other charges. They contended, that with lower rates, the traffic in fish from those and adjoining counties, and in vegetables from Cornwall, would develop enormously, and prove more advantageous to the railway companies than the present limited traffic at high rates, while not only those engaged in fishing and farming would greatly benefit, but also the consumers* in the large centres of population." Besides the cost of transport, the expense of distribution by fishmongers, costermongers, and others, is considerable. And over all this we must add the important element of destruction of fish, rain and heat being equally injurious to it. Whatever may be the reason, there is abundant evidence that fishermen's incomes are exceedingly meagre, whilst their liability to losses is considerable.

* The high cost of transport affects specially the cheaper kinds of fish. A cwt. of Salmon sells for £7 10s. Deduct 4s. 9d. for carriage, and 8s. 6d. commission, the net proceeds is £6 16s. 9d. A cwt. of Lobster, worth £5. Deduct 4s. 9d. carriage, and 6s. commission, and it leaves £4 9s. 3d. A cwt. of Mackerel costs only 15s. Deduct 4s. 6d. carriage, and 1s. 6d. commission, and the net proceeds is 9s. Upon the Salmon, the cost of carriage is in the proportion of 3 per cent. Upon the Lobster, in the proportion of 4½ per cent., and upon the Mackerel in the proportion of nearly 32 per cent.

**§ 14.—FISHERMEN'S LIABILITY TO LOSS OF LIFE AND
PROPERTY—INSURANCE.**

Liability to losses of life and property! Ah, this is the fisherman's great trial. But unfortunately of the extent of this danger we have not as yet sufficient information, for the obligation imposed by the Merchant Shipping Act of 1854 on the master and owner of merchant vessels to report all cases of death, does not apply to fishing vessels. Great disasters from storms come, indeed, to our knowledge from time to time, but of the many accidents which befall small fishing boats we hear nothing. In the Report on the Sea Fisheries some facts are supplied. At Grimsby, the number of casualties reported as having occurred to fishing vessels during the six years ended June 1882, was 202, or an average of 34 per annum. To the port of Grimsby, 1881, there belonged 3,879 men. Assuming two-thirds of the men actually employed, the loss from casualties would be at the rate of 13·14 per 1,000. At the port of Ramsgate the number of hands lost in the fishing smacks, in the year from October 14th, 1881, to October 1882, was 75, the number of persons belonging to the port 915, or actually employed 610, giving a proportion of nearly 123 per 1,000. These are a few instances showing great difference. I have, however, succeeded, I am happy to say, in obtaining, through our esteemed friend Mr. Birkbeck, M.P., and his friend Mr. Murray, M.P., a return showing the number of accidental deaths reported to the Registrar-General of Seamen as having occurred in fishing vessels during the years 1880, 1881, and 1882, and the results are as follows, see Appendix C. In the three years the number of deaths from accidents was 880, or an average of 293 per annum. Taking 80,000 fishermen as the total number actually em-

ployed during the year, the proportion of deaths would be 3·66 per 1,000,* the amount of danger being evidently greater with the larger boats than with the smaller, the returns, however, being most imperfect. We might expect that fishermen exposed to so much danger would be eager to insure their lives and property; but from what I learn many of them do not insure, and in case of disaster, in very many cases, they are altogether ruined. The system of mutual insurance doubtless exists largely among fishermen,† as among shipowners, at least as regards the boats, but difficulty exists in estimating the value of the nets at each shipping season, and thus the insurance of gear and net is not attempted, even among themselves, lest it should encourage fraud.

§ 15.—SOCIAL CONDITION OF FISHERMEN.

Whoever carefully examined the appearance of the four hundred fishermen and fisherwomen present at the opening of the Exhibition, will have noticed in their very faces

* His Royal Highness the Duke of Edinburgh gave the number of lives lost among fishermen during two years (what years?) at 857 or 428·5 per annum, or in the proportion of 3·9 per 1000 of the total number of men and boys engaged afloat in fishing, which he gave at 109,200. Comparing the risk attending fishing with that attending mining, it would seem that whilst in fishing the rate of loss of life in proportion to those actually employed is 3·66 per 1000, in mining the rate of loss in the ten years 1870 to 1880 averaged 2·3 per 1000. Whilst in fishing one life is lost for every 1,435 tons weight of fish captured in one year, in mining one death occurred for every 128,274 tons of mineral wrought; fishing is therefore considerably more dangerous than mining.

† The Scottish Boat Insurance Company, Limited, and the Scottish Fishermen's Accident Insurance Company, Limited, both at Fraserburgh, are doing a fair amount of business. The United Kingdom Boat and Fishermen's Accident Insurance Company, Limited, is also in course of formation in London, whilst the Shipwrecked Mariners and Fishermen's Society serves many of the purposes of an insurance Company, as will be seen in Appendix D.

several characteristics of their character and peculiarities. Many of the men had a face which seemed to have defied a thousand storms—a dark, sallow countenance, yet bold and firm features, indicating daring and adventure. Whilst the women, whether Scotch, French, or Dutch, had evidently a taste for all that is gaudy, showy, and gay. Go a little deeper into their nationalities, and you find them everywhere a peculiar people. Scandinavian blood is evident among the north-eastern fishermen, Phœnician blood among the Cornish, Spanish blood is seen among the Galway fisherfolk, and especially in the Claddach. Usually the women are full of energy and action, the children uproarious and precocious. Living on the sea-shore, and mostly in healthy districts, the fisherfolk ought to be healthy and strong, and so they are to some extent, though their life is worried by constant anxiety and peril. The statistics of the principal fishing ports for the year 1880–81 around the English coasts are, on the whole, satisfactory. The following are a few salient results :—

Fishing Ports.	Number of persons to inhabited house.	Proportion per cent. Married under age per 1000.	Proportion of Illegitimate per cent.	Rate of Mortality.	Rate of Pauperism.	Rate per 1000 of Commitments for Drunkenness.	Amount at the Savings Bank per head.
Whitby . . .	4·84	14	3·77	18·3	32	..	26/
Grimsby . . .	5·09	18	4·70	17·2	23	9·50	13/
Hastings . . .	6·63	10	4·36	17·9	25	1·58	33/
Margate* . . .	5·65	17	4·41	18·2	22	5·03	54/
Ramsgate* . . .	5·38	17	4·41	18·2	22	7·91	33/
Yarmouth . . .	4·56	22	6·82	22·6	33	4·52	108/
Lowestoft† . . .	4·88	17	3·27	16·2	33	4·06	53/
St. Ives . . .	4·34	14	6·53	17·7	40	..	12/6
Average of fishing ports . . . }	5·17	16	4·78	18·3	29	4·90	44/
England and Wales . . . }	5·37	14	4·80	20·5	31	6·70	52/

* Registration District, Thanet.

† Registration District, Mutford.

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Education	2	12	0
Church	2	10	0
Doctor's Bill	1	0	0
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APPENDIX C.

A RETURN SHOWING THE NUMBER OF ACCIDENTAL DEATHS REPORTED TO THE REGISTRAR GENERAL OF SHIPPING AND SEAMEN AS HAVING OCCURRED IN FISHING VESSELS DURING THE YEARS 1880, 1881, AND 1882, CLASSIFIED ACCORDING TO THE TONNAGE OF THE VESSELS ON WHICH SUCH DEATHS HAPPENED.

Classification of Tonnage.	1880.				1881.				1882.				Total Number of Deaths.
	Cause of Death.				Cause of Death.				Cause of Death.				
	Drowned by Wreck.	Drowned by Accident other than Wreck.	Other Acci- dental Deaths.	Total Number of Deaths.	Drowned by Wreck.	Drowned by Accident other than Wreck.	Other Acci- dental Deaths.	Total Number of Deaths.	Drowned by Wreck.	Drowned by Accident other than Wreck.	Other Acci- dental Deaths.		
Vessels under 15 tons	15	1	..	16	..	..	..	..	..	..	..	..	..
Vessels of 15 tons and } under 30 tons . . }	16	11	..	27	38	11	..	49	45	15	1	61	61
Vessels of 30 tons and } under 50 tons . . }	101	25	1	127	143	30	4	175	85	32	..	117	117
Vessels of 50 tons and } upwards . . . }	57	55	..	112	43	42	1	88	45	62	1	108	108
Total . .	189	92	1	282	224	83	5	312	175	109	2	286	286

GENERAL REGISTER AND RECORD OFFICE
OF SHIPPING AND SEAMEN.
20th June 1883.

ROBERT JACKSON,
Registrar General.

APPENDIX D.

SHIPWRECKED FISHERMEN AND MARINERS' SOCIETY.

RELIEF TO MEMBERS.—The Society, with a view to promoting and encouraging *moral and provident habits* amongst our Fishing and Seafaring Men, of all Classes, *promptly assists*, by a graduated Scale of fixed Relief, under the *many sudden losses and perils, &c., incidental to their hazardous calling*, those Fishermen, Mariners, and other persons occupied on the Sea, duly contributing the regulated small yearly payment to the Society's Funds, as *Members*; while, in the event of their *Death*, however caused, the dependent Widows and Orphans, &c., of such Members, are *at once substantially helped*, and, in after years, in *their needy circumstances*, further aided, within certain limits, by *extra grants* of charitable relief.

RELIEF TO NON-MEMBERS.—The administration of this *general relief* is made, *irrespective of Membership of the Society*, according to the actual necessitous circumstances of each particular Special Case of *Maritime Disaster and Distress*, &c.

Member's Yearly Payment—for Fishermen, Mariners,	} Three Shillings.
and all Persons occupied on the Sea, who at the	
time of joining have not passed their Fortieth	
Birthday	
Extra Yearly Payment—to the Supplemental Fund,	} Three Shillings.
for Extra Benefits	

THE SCALE OF RELIEF granted to Members for Losses, &c., and to their Widows and Orphans, or Aged Dependent Parents, is as follows (subject to the Conditions specified on the Ticket of Membership):—

Number of Years a Member.	Fishermen or Mariners for Loss, &c., of Boats or Clothes.	Widow (or Dependent Aged Parents).	Widow and One Child.	Widow and Two Children.	Widow and Three Children.	Widow and Four Children.	For each additional Child.
	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.	£. s. d.
1	1 10 0	3 0 0	3 15 0	4 10 0	5 5 0	6 0 0	0 15 0
2	1 12 6	3 5 0	4 1 3	4 17 6	5 13 9	6 10 0	0 16 3
3	1 15 0	3 10 0	4 7 0	5 5 0	6 2 6	7 0 0	0 17 6
4	1 17 6	3 15 0	4 13 9	5 12 6	6 11 3	7 10 0	0 18 9
5	2 0 0	4 0 0	5 0 0	6 0 0	7 0 0	8 0 0	1 0 0
10	2 12 6	5 5 0	6 11 3	7 17 6	9 3 9	10 10 0	1 6 3
15	3 5 0	6 10 0	8 2 6	9 15 0	11 7 6	13 0 0	1 12 6
21	4 0 0	8 0 0	10 0 0	12 0 0	14 0 0	16 0 0	2 0 0
30	5 2 6	10 5 0	12 16 3	15 7 6	17 18 9	20 10 0	2 11 3
40	6 7 6	12 15 0	15 18 9	19 2 6	22 0 0	25 10 0	3 3 9

ployed during the year, the proportion of deaths would be 3·66 per 1,000,* the amount of danger being evidently greater with the larger boats than with the smaller, the returns, however, being most imperfect. We might expect that fishermen exposed to so much danger would be eager to insure their lives and property; but from what I learn many of them do not insure, and in case of disaster, in very many cases, they are altogether ruined. The system of mutual insurance doubtless exists largely among fishermen,† as among shipowners, at least as regards the boats, but difficulty exists in estimating the value of the nets at each shipping season, and thus the insurance of gear and net is not attempted, even among themselves, lest it should encourage fraud.

§ 15.—SOCIAL CONDITION OF FISHERMEN.

Whoever carefully examined the appearance of the four hundred fishermen and fisherwomen present at the opening of the Exhibition, will have noticed in their very faces

* His Royal Highness the Duke of Edinburgh gave the number of lives lost among fishermen during two years (what years?) at 857 or 428·5 per annum, or in the proportion of 3·9 per 1000 of the total number of men and boys engaged afloat in fishing, which he gave at 109,200. Comparing the risk attending fishing with that attending mining, it would seem that whilst in fishing the rate of loss of life in proportion to those actually employed is 3·66 per 1000, in mining the rate of loss in the ten years 1870 to 1880 averaged 2·3 per 1000. Whilst in fishing one life is lost for every 1,435 tons weight of fish captured in one year, in mining one death occurred for every 128,274 tons of mineral wrought; fishing is therefore considerably more dangerous than mining.

† The Scottish Boat Insurance Company, Limited, and the Scottish Fishermen's Accident Insurance Company, Limited, both at Fraserburgh, are doing a fair amount of business. The United Kingdom Boat and Fishermen's Accident Insurance Company, Limited, is also in course of formation in London, whilst the Shipwrecked Mariners and Fishermen's Society serves many of the purposes of an insurance Company, as will be seen in Appendix D.

several characteristics of their character and peculiarities. Many of the men had a face which seemed to have defied a thousand storms—a dark, sallow countenance, yet bold and firm features, indicating daring and adventure. Whilst the women, whether Scotch, French, or Dutch, had evidently a taste for all that is gaudy, showy, and gay. Go a little deeper into their nationalities, and you find them everywhere a peculiar people. Scandinavian blood is evident among the north-eastern fishermen, Phœnician blood among the Cornish, Spanish blood is seen among the Galway fisherfolk, and especially in the Claddach. Usually the women are full of energy and action, the children uproarious and precocious. Living on the sea-shore, and mostly in healthy districts, the fisherfolk ought to be healthy and strong, and so they are to some extent, though their life is worried by constant anxiety and peril. The statistics of the principal fishing ports for the year 1880–81 around the English coasts are, on the whole, satisfactory. The following are a few salient results :—

Fishing Ports.	Number of persons to inhabited house.	Proportion per cent. Married under age per 1000.	Proportion of Illegitimate per cent.	Rate of Mortality.	Rate of Pauperism.	Rate per 1000 of Com-mittals for Drunkenness.	Amount at the Savings Bank per head.
Whitby . . .	4·84	14	3·77	18·3	32	..	26/
Grimsby . . .	5·09	18	4·70	17·2	23	9·50	13/
Hastings . . .	6·63	10	4·36	17·9	25	1·58	33/
Margate* . . .	5·65	17	4·41	18·2	22	5·03	54/
Ramsgate* . . .	5·38	17	4·41	18·2	22	7·91	33/
Yarmouth . . .	4·56	22	6·82	22·6	33	4·52	108/
Lowestoft† . . .	4·88	17	3·27	16·2	33	4·06	53/
St. Ives . . .	4·34	14	6·53	17·7	40	..	12/6
Average of fish- ing ports . . .	5·17	16	4·78	18·3	29	4·90	44/
England and Wales . . .	5·37	14	4·80	20·5	31	6·70	52/

* Registration District, Thanet. † Registration District, Mutford.

1st. As to the character of the Irish fishermen, and how far their want of success is more due to want of energy and industry than to want of capital or defects in the fisheries. To this I reply that their want of success is not due to either of the causes stated, but to the want of capital to carry on their operations, and the absence of enterprise on the part of those who have the means to embark in the speculation of fishing as merchants and others do in other countries. This latter want I believe is mainly attributable in many places, particularly on the west and north-west coasts of Ireland, to the risks attendant on a good class of fishing vessels suitable for fishing such a coast; from the want of proper harbours to which they could run in case of stress of weather, and the difficulty and expense attending on the transport of fish from distant parts of the coast. I have known a basket of lobsters sent to the English markets to return to the fishermen only a sum of *two pence*, so heavy were the charges for road, rail, and water carriage. And as for crabs of the finest description, they are a complete drug in Ireland. Gladly would the fishermen round the coast accept 2s. to 3s. a dozen for them, and 9s. to 10s. or 12s. for the best lobsters, if there were any persons to collect them—say in welled smacks—which could bring them alive safely to the English markets. The finest live cod could also be obtained during the season from 6s. to 9s. a dozen.

That the fishermen are, as a rule, not deserving of the character of want of energy or industry I could give many instances and quote many reports. In their Report of 1870, the Royal Commissioners entered fully into this matter, and quote as follows from a pamphlet entitled 'Facts from the Fisheries,' written by the Reverend Mr. Alcock, the Protestant pastor of a parish in the county Waterford. He says: "No weather prevented them from putting to sea in search of fish, so great was their anxiety and ambition to be distinguished for industry, hardihood, and perseverance. Often have I stood watching them after a night of excessive labour and hardship, pushing up their boats against a steep bank beyond the reach of the sea, their backs streaming with blood from the exertions they were forced to make." And the Commissioners themselves say, "It would be difficult to find any class in the community deserving a higher character for sobriety, honesty, peaceable conduct, and industry, than the Irish fishermen."

Examples of their energy and industry may be seen by any one visiting Cape Clear and Baltimore district on the south coast, where, through the discriminating aid afforded by that most charitable lady the Baroness Burdett Coutts (*nomen nobile*) to enable them to follow their avocations, some of the finest, most enterprising, and industrious fishermen that could be found in any country are now to be found, and this all brought about by timely help in the shape of loans, which are being repaid with a punctuality that would form an example, and be a striking contrast, to others in exalted positions in life. Again, in many parts of the coast where there were no nets for many years amongst the fishermen, and who depended on the precarious character of line fishing, on the people being supplied with nets they eagerly went to work and realized large profits. I have it on sworn evidence, at an inquiry held by myself, that in one locality where nets to the amount of £200 were supplied, over £1,200 worth of mackerel were sold in three or four weeks.

Let any one witness the fishermen on the counties of Clare and Mayo and other coasts going out of a night in their frail canoes through a raging sea to obtain a livelihood for themselves and their families, and they will never say they lack energy or industry ; and the facts that there have been lent to the poorest of them by our department nearly £50,000, and that there are not more than £1,000 arrears ; that they are punctually repaying the loans made to them by the Baroness Burdett Coutts ; and that loans made to them from a small charitable fund with which I am connected are being repaid in the most punctual manner—are the best evidences of their character for *honesty*.

2ndly. The usual conditions between owners of boats and fishermen are shares after deducting expenses. As a rule the men are not in partnership with the owners.

3rdly. It is very difficult to say what are the earnings or wages of the fishermen annually. In the case of large smacks or trawlers about £1 to £1 5s. a week would be a fair average. In the case of small boats owned by the fishermen themselves I could hardly put down a sum as a fair average, but I am quite sure it does not come near that sum.

4thly. Except, on the east and south and part of the south coasts the kind of boats used are open row boats—yawls or Curraghs—quite too small to carry on fishing properly. These boats and Curraghs cost different sums according to their character, varying from £2 to £20 and £25. Fishing smacks on east and south coasts £500 to £700.

5thly. The transport of fish is usually by land to Dublin or Greenore for England from the west and north-west, and from the south and east the fish are conveyed during the mackerel or herring fishing by steamer direct to England.

6thly. Great complaints are made of the high rates of carriage of fish from Ireland. I am informed that the carriage of fish from the North Sea to Billingsgate by steamer is only about £1 a ton, while fish conveyed by land and steamer from Ireland costs £4 to £5 a ton.

My letter has extended to a greater length than I had anticipated. I hope, however, it will give you the information you desire. It is written with an intimate knowledge of the fishermen round the entire coast of thirty-eight years in the public service. The Irish fishermen do not want to ask for charity but capital, to be repaid, and which will not bring with it the taint of pauperism ; protection for their fishing vessels and boats ; and a means of bringing their harvest to the best markets ; and I believe, these accomplished, the State could not have a more important portion of the community attached to it than the Irish Fishermen.

Yours faithfully,

THOMAS F. BRADY.

Professor LEONE LEVI.

APPENDIX G.

ECONOMIC CONDITION OF FISHERMEN IN CANADA.

LONDRES, 17 mai 1883.

CHER MONSIEUR,

J'ai l'honneur d'accuser réception de votre lettre d'hier, me demandant certaines informations se rapportant à la condition économique des Pêcheurs Canadiens.

Je regrette que des occupations trop nombreuses ne me permettent pas, aujourd'hui, de répondre aussi longuement que je le voudrais aux questions que vous me posez. J'espère avoir l'occasion de revenir sur ce sujet, donc je répondrai succinctement.

1° Généralement les Pêcheurs Canadiens font la pêche sur des bateaux fournis par des capitalistes armateurs; le bateau de pêche seul est fourni, et le pêcheur doit acheter lui-même les agrès dont il peut avoir besoin, tels que filets, lignes, etc.

Le produit de la pêche appartient au pêcheur, qui vend son poisson, à l'état frais, à l'armateur qui lui fournit le bateau de pêche.

2° Le revenu hebdomadaire ou annuel du pêcheur varie, suivant les circonstances. Ce revenu peut être d'environ trois cents piastres par année, en moyenne.

3° Le Pêcheur Canadien n'a aucunement la pensée d'assurer sa vie, encore moins son bateau de pêche et ses filets; et, après trente années de séjour au milieu d'une population composée de pêcheurs, je ne pourrais citer un seul exemple de ce fait.

4° Je regrette de dire que généralement la condition de nos pêcheurs est assez précaire. Ils n'ont aucune idée d'économie et, malgré de très bonnes intentions, dépenseront en une semaine ce qui aurait suffi pour un mois. D'ailleurs, comme toutes les populations subsistant entièrement du produit de la mer, ils dépensent le produit de leur pêche au fur et à mesure et vivent au jour le jour, sans nul souci du lendemain.

Le système d'avances et de crédit, inhérent à toute exploitation de pêche, contribue aussi beaucoup à entretenir chez le pêcheur cette apathie et ce défaut d'économie.

Je dois constater ici cependant que, depuis quelques années, il y a tendance à amélioration de ce côté, et il est à espérer que la nouvelle génération, étant plus instruite, puisera dans cette instruction même des idées d'ordre et de prévoyance.

Un très grand nombre de nos Pêcheurs Canadiens s'occupent aussi de la culture de la terre et conduisent, avec succès, ces deux opérations; ceux-là vivent, presque tous, dans une aisance relative, habitant des maisons convenables et proprement tenues; mais cette partie de la population qui s'occupe exclusivement de pêche habitent, le long du littoral du Golfe Saint-

Laurent et des provinces maritimes, des maisons très petites et pauvrement montées, où ils ne peuvent goûter aucun des comforts de la vie.

Chose digne de remarque, le Pêcheur Canadien, surtout aux jours de fête, est comparativement très bien vêtu ; il aime à *s'habiller* et dépensera, pour cet objet, bien plus que ses moyens le lui permettent ; il s'endettera même, afin de paraître bien vêtu.

J'ai l'honneur d'être,

Cher Monsieur,

Votre bien dévoué,

L. Z. JONCAS, Commissaire Canadien.

Professor LEONE LEVI.

P.S.—J'aurai du plaisir à vous donner toutes les explications verbales dont vous pourriez avoir besoin après la lecture de cette lettre.

DISCUSSION.

Mr. BRADY said he was one of those who had, during a long course of public life, witnessed the great privations and hardships which fishermen had to undergo, particularly on the west coast of Ireland, and he might say that Professor Levi had not at all exaggerated those hardships. Amongst the matters connected with the economic conditions of fishermen, to which reference had been made, perhaps the most important was the question of the mode of employing the men ; and while he agreed that the best principle economically was to pay the labourer for his work in money, he could not see clearly how, with such a precarious occupation as fishing, this could be carried out satisfactorily to the employer. The dangers were great, the work very precarious, and at the end of the season there might be a blank altogether ; and he was afraid, if the principle were adopted of paying regular wages, the employer would soon have to withdraw his capital. A great incentive to the fisherman at the present moment was the knowledge that the harder he worked the more he earned. Many philanthropists had endeavoured to improve the condition of fishermen, and some had even gone from England to Ireland for this purpose, but they had always failed where regular wages were paid. Where they paid for results, in most cases, at any rate, the results had been satisfactory. According to strict economical principles this must be wrong, and what was said about the wives and children living in almost a state of starvation, while the husbands at sea were probably well fed, was undoubtedly the fact ; when the men came home they might have a little money to pay their debts, but, if they

had not, there was nothing for the shopkeeper, and then the difficulty was, how the wife and children were to live. He should be glad to see the professor's suggestion carried out, but he was doubtful of its success. Reference had been made to the vast number of accidents which occurred in connection with fishing, and he was sorry to say there was an unwillingness on the part of these men to insure either their lives or their property ; but, at the same time, he thought more might be done to bring this matter before their notice, and possibly the rates might be reduced. In October, 1881, the west coast of Ireland was visited by one of the severest storms which had occurred for many years, and he found that the value of the boats lost—none of them being first-class boats—between the Shannon and Donegal, amounted to over £8,000. The owners were absolutely ruined by the loss of their boats. They might have effected a certain amount of insurance, at any rate, by joining a very useful society which was established in London under the patronage of Her Majesty, "The Shipwrecked Fishermen and Mariners' Society." That had done a great deal of good throughout the kingdom. Attention had been called to the class of boats used in some parts of the coast of Ireland, and the Exhibition had, perhaps, afforded to hundreds and thousands of people an opportunity, which they had never before had, of examining some of those frail craft. Those who did so would wonder that any man would risk his life in them even a mile out at sea. Nevertheless, people did work in them whenever the weather allowed. He was sorry to say that Irish fishermen seemed to have got a character attributed to them for laziness ; but, from his knowledge of them for forty years, he must say that whenever they had an opportunity of working, they had shown an amount of industry

and daring which was creditable to any community. As to their moral character, he believed that would vie with any country in the world ; and, as a convincing proof of their honesty, he might mention that the Government had, during the past eight years, lent to the poorest class of fishermen nearly £50,000 for the purchase of boats and gear, and out of that sum the total amount of arrears still due did not come to £1,300. Not one single man on the coast had been accused of any crime. He trusted one of the results of this International Exhibition would be to devise some means through which the economic condition of our fishermen might be improved.

Mr. SAYER said Professor Levi had touched on many points, but he had not touched on what was perhaps the most important, namely, the cost of the railway carriage of fish as compared with other things. When they found that the Great Western Railway charged 65s. a ton for fish, and only 8s. 4d. for coal, it was evident that the cutting down of these railway rates would not only improve the economic condition of fishermen, but also aid in getting larger quantities of fish to the London markets. Again, the Great Northern and the London and North-Western would bring potatoes for 30s. a ton, but they charged 75s. for herrings and sprats, which were the poor man's fish. He hoped the Commissioners of the Exhibition would do what they could to get a reduction of these rates, and the population of London generally would then be able to get, as was shown in the Exhibition, a good meal of fish, bread, and potatoes, for 6d. These cheap fish dinners were given in order to educate people in the use of inexpensive fish, which were just as nutritious as soles and salmon costing 1s. a pound. Again, it was stated in the Paper that the expense of distribution by costermongers was very great.

If the learned professor had said fishmongers he could have agreed with him, but the costermongers certainly sold fish cheap. The poor in London got their fish cheap, and the rich could also, if they liked to go to the forty markets that surrounded London, such as the New Cut, White-chapel, and so on. There was no occasion for new markets, for there were already forty in and around London.

Mr. CROSSMAN hoped the discussion on this very valuable Paper would not conclude to-day, but would be taken up again in connection with the Paper recently read by H.R.H. the Duke of Edinburgh, the two subjects being much connected, there being many points common to both. If the Exhibition did nothing else but produce these two addresses, it would still have performed a great service in having brought the public face to face with one of the most important elements of the community—the fishing population. Everything which Professor Levi had brought forward was well worthy of consideration, but he thought Mr. Brady had a little misapprehended the drift of his observations as to how fishermen should be paid, the suggestion being that they should be paid not by wages alone, but practically by results. There was no doubt that the tremendous risks which fishermen ran put them in a different condition to the ordinary labourer. Every time a fisherman went to sea he was unaware what tremendous disaster might befall him at any moment. No doubt there were aneroid barometers and other appliances devised for prognosticating the weather, but the fishermen might be in the very centre of a cyclone, and the needle of his aneroid would scarcely move; he might not be in danger when he started from the shore, but yet he might soon be overtaken by one of those tremendous storms which were so destructive. There were points suggested in H.R.H.

the Duke of Edinburgh's Paper with regard to the insurance of fishermen, which were of great importance ; and, as a member of the Shipwrecked Fishermen's Society, he wished to state, in the broadest manner possible, that the society was prepared to take upon itself any responsibility which might be cast upon it, in order to promote insurance. It had been at work for the last forty years in a small but efficient way, as might be judged from the fact that there were upwards of 60,000 fishermen in the United Kingdom who paid 3s. a year to the society. That formed the nucleus of a great work in connection with insurance, and he hoped whenever this question of insurance was discussed, the Shipwrecked Mariners' Society would be kept well in front, and additional powers should be given to it by Act of Parliament rather than that, which was very frequently done, viz., a new society started.

EARL DUCIE regretted that he was not able to be present during the whole of the address, but he had heard enough of it to be satisfied that it was very valuable, and contained many matters worthy of deep consideration. He had, therefore, much pleasure in proposing a hearty vote of thanks to Professor Leone Levi.

The DUKE OF MANCHESTER, in seconding the motion, said he was very much struck by the observation which had been made early in the discussion as to the extravagant charges which seemed to be made by railways for the carriage of fish. The amounts named certainly seemed excessive, and he could scarcely understand how they could be submitted to or persevered in unless there were some economic circumstance enabling the railways to make these excessive charges, and which prevented those requiring their fish carried getting the rates reduced. Probably one reason might be that there was only one railway communicating

from the port at which the public were landed to the large centres of population where they were to be sold ; whereas fishermen, as a rule, were competing with each other, yet in one particular port they had only one means of communication to the large markets. But there was one point to be considered, viz., that when the fish got to these large centres there seemed to be great difficulty in distributing the fish by retail to the inhabitants. It was admitted on all hands that there was great destruction of fish, whether voluntarily, in order to reduce the excessive supply, or perhaps accidentally, from the fish not being able to get to the market in time.

Mr. SAYER, in reply to the observation just made, desired to say that from Milford the Great Western Railway had a monopoly, but from Liverpool there were steamers running, which controlled the monopoly to some extent. From the North Sea, again, there were nineteen steamers running, bringing fish direct to London at £1 a ton, and paying about 10 per cent. for the outlay on capital. If, however, they ran into Grimsby and Hull, the railway charged £2 a ton to bring fish to London.

The resolution was carried unanimously.

The Hon. A. W. MCLELAN moved a vote of thanks to the Chairman, which was seconded by Mr. SAYER, and carried unanimously.

The CHAIRMAN, in acknowledging the compliment, said he had been called upon quite unexpectedly, and therefore he hoped he might be pardoned any shortcomings. It had been the greatest pleasure to listen to the Paper, and to hear the valuable suggestions which the learned professor had put forward both with regard to the habits of thrift amongst the fishermen and also with regard to insurance both of life and property. As a mariner himself, and

seeing many distinguished foreign officers present, he could not help bearing testimony to the great service which fishermen were constantly in the habit of rendering, not only in providing seamen for the Royal Navy and Mercantile Marine, but also in giving assistance to vessels coming from abroad by acting as pilots, and in many other ways where their services were needed. This was characteristic not only of English fishermen, but of foreigners as well ; and, in addition to that, if a ship was so unfortunate as to go ashore, fishermen were the first to man the boats and put off to the rescue, even at the hazard of their own lives. He was glad to have heard a few words in behalf of the Shipwrecked Mariners' Society, which was well deserving of support.

A
NATIONAL FISHERIES SOCIETY.

BY
CHARLES E. FRYER,

AUTHOR OF THE EXHIBITION HANDBOOK ON 'THE SALMON FISHERIES.'

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CONFERENCE ON JULY 27, 1883.

EDWARD BIRKBECK, ESQ., M.P., Chairman of the Executive Committee, in the chair.

A NATIONAL FISHERIES SOCIETY.

Mr. FRYER spoke as follows :

WHEN I was invited, before these Conferences began, to read a Paper on some question connected with the Fishing Industry, and suggested, as a subject, the proposal, which I have the honour to bring under your notice to-day, for the formation of a National Society which should take up and carry on permanently, and on an extended basis, the good work which this Exhibition is, for the time being, doing in promoting a practical knowledge of the Fisheries, and in fostering enterprise in their development, I little thought that my suggestion would have received, by anticipation, such influential support as was accorded to it in the Inaugural Address delivered by the distinguished gentleman under whom I have the honour to serve, and who then expressed the "confident belief . . . that in these Conferences we have the germ out of which, by due process of evolution, a society especially devoted to the promotion of the interests of the fisheries of these islands may spring."

Unless, by some process of "thought-reading" peculiar to himself, Professor Huxley was able to ascertain what was then going on in my mind, he could not have had the

smallest notion of my intention to deal with this subject: and, although he may be said to have "taken the wind out of my sails" when he uttered the words I have just quoted, I have the gratification of feeling that, whether we take different courses, or sail all the time in company, we are both bound for the same port, and that my little barque is sailing under the same flag as his good ship. I trust that before I sit down I may have been enabled to induce many other vessels to join the squadron.

Before discussing how a "National Fisheries Society" can be formed, we must consider what such a body would have to do.

The interests involved in that word "Fisheries" are very many and very vast. First, we have the fish, properly so-called, and other marine animals, the capture of which is included in the term "fisheries": their varieties: their food: their habits: their habitat: their friends: their enemies. Next, we have man in his relation to the destruction of fish: his various appliances for their capture: their transport: their sale: and their preparation for food and other purposes. This branch of the subject directly affects the important industries of boat-building and fitting; net-making; hook-making; and the questions of market accommodation and communication between producer and consumer. Then there come the questions of the protection of fish, and the desirability or otherwise of taking direct measures for their multiplication; of the maintenance of order among those engaged in the industry; and of their welfare—moral and physical—both at sea and ashore. Last, but not least, have to be considered the large array of industries and interests indirectly affecting, or affected by, the fisheries, such as the manufacturing, milling, mining, agricultural, and navigation interests; the question of drainage as touching

the inland waters and the waters immediately contiguous to our coasts ; and then, on the wide sea, the great shipping interest, with its questions of lighthouses, harbour-accommodation, "rules of the road," and so forth.

Most of these individual points have already been dealt with in the various papers read before the Congress, and it is needless, therefore, even if it were possible, in a short Paper like this, to do more than touch the fringe of this far-reaching subject, in which each detail,—like the thousand threads in the weaver's loom, where a vast fabric of various colours and intricate pattern is being woven,—has its allotted part to play. A few illustrations will serve to show the opening there is for a duly qualified central body to gather up the various threads, many of which lie ravelled and in a confused heap, and to work them, each in its due order, into a complete and harmonious whole.

First, then, as to the natural history of fish. It is obvious that, before the fisherman can set to work satisfactorily to catch the fish, he must know when, and where they are to be found. Before he can arrange to follow them, he must find out whether they are migratory or sedentary in their habits ; and he will find it necessary to discover the causes which lead to their migration ; whether, for instance, the state of the weather has any influence upon them ; or, whether their movements are affected by the presence or absence of food, or of enemies. Before he can arrange the length and depth of his lines and nets, he must be assured whether the fish swim near the bottom, or close to the surface, or midway between the two. Before he can select his bait, he will want to know what is the favourite food of the particular fish he is intent on hooking. But, though the fishermen number among them many acute observers who are able, after long experience, to judge of the prospects of

their night's work from signs which would escape the ordinary looker-on, many of these points are beyond their power to elucidate. A skilled fisherman will tell by the colour of the water, by the flight of a flock of sea-gulls, or by the movements of a school of porpoises, whether a shoal of herrings, pilchards or mackerel is within "measurable distance" of being caught. He will know too well, when the waves are crested with that beautiful phosphorescent light which visitors to the seaside like to watch on a dark night, that his chances of a good catch are very small, since the fish will see his nets as they hang, like a sheet of liquid fire, near the surface. But he cannot tell what part the minute organisms, which give rise to these phenomena, may be playing in the economy of the fish; he cannot always tell you where or when the different kinds of fish spawn; he can only guess where the migratory fish go after their periodical visits to the shore; and he is utterly at a loss to explain the reasons of their occasional total disappearance for several years at a time from a coast which they have visited regularly, year after year, as long as he can recollect. Round our own coasts, off those of Norway, Holland, or France, in the United States, wherever you go, you will find records of the occasional utter annihilation of a fishery which for years had been an annual source of enormous wealth. Many thriving cities, revelling in the wealth of an abundant herring fishery, for instance, have been suddenly ruined because the fish have, for some inscrutable reason, forsaken their accustomed haunts. The history of the ancient cities of Marstrand and Uddevalla in Norway, and in more recent times of Bergen and Trondhjem, and, in our own country, of Ullapool, Fort William, and other places, the fortunes of all of which, made by the abundance of the herring, have been often

marred by their sudden disappearance, is well worth studying in connection with this subject.

It is difficult, but who shall say that it is impossible, to discover, first, the causes of these fluctuations and occasional failures of a fishery; and, second, the localities to which the fish migrate during their disappearance. The list of causes that have been suggested for the occasional local failure of herring fishery, is a formidable one, ranging from "overfishing" to the "burning of sea-weed," from the "building of lighthouses" to the "employment of steamers," and from "making noises on shore" to the "wickedness of the people." Curiously enough, this last reason is very commonly alleged, not only in England and Scotland, but in Holland, and in Sweden and Norway. In the latter country, indeed, the people, some 300 years ago, reproached themselves—or each other, more strictly speaking, perhaps—so bitterly for having been, by their sins, the cause of the disappearance of the herring, that a law was passed for the express purpose of improving the morals of the people, and so inducing the fish to come back. I need hardly say that this law—whatever its effect on the people—had no more effect on the fish than a proclamation calling on them to return at the peril of their lives would have done; or an advertisement in the *Times*, setting forth the fact of their "mysterious disappearance," and asking them to return to their anxious friends, when "all would be forgiven." But the herrings did return—when it pleased them—some years afterwards, only to go away and return again at intervals of a few years.

These intermittent periods of plenty and scarcity—notably in the case of the Great Bohuslan fishery—have continued ever since, and probably will continue until the end of time; but, if we cannot prevent the occasional

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disappearance of any particular kind of fish, we may possibly be able to prevent the ruin which its disappearance entails on large communities of industrious and hardy fishermen and their families ; we may possibly find out where the fish go, and so enable the fishermen to follow them ; or we may at least prepare the fishermen for the impending failure of one branch of their industry and enable them to take measures for the more efficient prosecution of another. At any rate, if we can prove that it is Nature and not Man that is at the bottom of the matter, we shall not have demands for hasty legislation restricting the fishermen in the pursuit of a calling which requires development rather than curtailment. On the other hand, if it is found that man's interference has had a prejudicial effect on the fisheries, and that Man and not Nature is the cause of their deterioration, we shall be able to enact wise laws for their protection, instead of taking a "leap in the dark," which may be productive of disaster rather than of benefit.

Though artificial causes undoubtedly do exert a very powerful and often very destructive influence upon certain fisheries, such as those of our rivers and lakes, and others confined within comparatively narrow limits close to the shore, it is evident that the farther you get out into the deep sea the more infinitesimal are the effects of your mightiest efforts. In the case of fish of such prodigious powers of reproduction as the herring, the cod, the haddock, the mackerel, the whiting, the hake, and others, of which, for every one that all the fishermen in the world catch, tens and hundreds are destroyed by their natural enemies and by each other—the fathers and mothers often preying upon their own children—it is not difficult to see that not only is the cry of "over-fishing" a false alarm, but our appliances

for the capture of these fish might be made very much more efficient with very great advantage.

Such an improvement in the methods of capture might very easily be expected as our acquaintance with the habits of fish increased; and it is consequently essential to the future development of the fisheries that, from this point of view alone, a systematic study of these questions should be conducted under the control of a central institution where results would be recorded and whence practical information would be disseminated among those who would be benefited thereby.

It not infrequently happens that, while the fishermen in one country are groping in the dark towards the discovery of an improved mode of fishing, a new form of net, a fresh kind of bait, or a handier rig for their boats, their fellow craftsmen in other countries have anticipated them, and improvements have become established facts in one country which in another exist only as vague ideas. An illustration of this has come under my notice in the present Exhibition. In the collection of nets from Cornwall is shown a model of an improvement in seine nets, suggested by Mr. Matthias Dunn of Mevagissey. A seine net is a net which is shot in a circle round a shoal of fish, so as to completely surround them, the head-rope of the net being buoyed by corks and kept floating on the surface, while the foot-rope is leaded so as to touch the ground. A large shoal of pilchards or mackerel can be enclosed in this way beyond possibility of escape, and the fish are then taken out of the water in detachments by means of a smaller net, called a "tuck-net," which is shot inside the seine, until all the shoal has been caught. But, from the nature of the case, a seine can only be used in shallow water, and the fishermen have to wait until the fish are within such a distance of the

shore that the bottom of the seine may be certain of touching the bottom of the sea. Mr. Dunn conceived the idea of so arranging the seine that, when shot in deep water round a shoal of fish, the bottom edges of the net might be drawn together by ropes and the fish prevented from escaping by "sounding." When he came up to London he found a precisely similar idea carried out in what is called a "purse-seine," exhibited in the United States section of the Exhibition, and he then learnt that this net had been in successful operation in America for several years, and that shoals of fish, which would otherwise have escaped capture, had been caught far out at sea in deep water by its means. No doubt when Mr. Dunn conveys this piece of information to his fellow-countrymen in Cornwall he will find less difficulty in inducing them to adopt the system than he had when it was merely a "new-fangled idea" of his own. But if there had been some central authority—such as the Society whose formation I advocate—to whom Mr. Dunn could have applied for information as to whether his idea was entirely new, or had been adopted or found impracticable elsewhere, he might have been saved much trouble, and the fisheries whose interests he has so much at heart might have derived earlier benefit from the introduction of the net into general use.

A "National Fisheries Society" aiming at showing what might be done in our own country should in this way be in a position to give the fullest information as to what is being done in every other country. While professing to be National in its aim, it would be really International in its character. I am sure that such an institution would not fail to meet with every encouragement, not only from those connected officially and privately with the fishing industries of the wide possessions of the British Crown in every part

of the world, but from those Foreign States which have contributed so largely to the success of this Exhibition, where they have taught many of us so many things that we never knew before, and whose representatives have been so ready to furnish information to every one wishing to learn anything about their important and interesting fisheries. Speaking personally, I have never yet failed to receive the most courteous consideration at the hands of every one to whom I have applied, officially or privately, for information on any subject connected with fish and fishing in other countries; and I feel sure that I may promise, should the Society, the germ of which I venture to bring to your notice to-day, ever become the important body into which I should like to see it develop, that it will always be ready to reciprocate, to the best of its power, the good-will with which its friends in other countries would, I venture to anticipate, welcome its birth, and watch and assist its growth.

A more intimate acquaintance with the natural history of fish, and a thorough study of the extensive array of natural phenomena affecting the fisheries, are a necessary precedent, not only to the full development of the practical fisherman's art, but to the adoption of beneficial legislation. Laws based on incomplete information are pretty certain to be ineffectual and inconvenient, if not positively injurious to the fisheries and to those concerned in them. No one in his senses would propose to make the close time for salmon, for instance, begin at this period of the year. Yet this is precisely what was done by two very well-intentioned Acts of Parliament passed, the one in the reign of good Queen Anne, and the other in the reign of George I. The former of these laws forbade the taking of salmon in the Hampshire rivers from June 30 to

November 11, and the latter prohibited their capture in the Severn, Wye, and most of the English rivers north of the Dee and the Trent between July 31 and November 12. As the object of a close season is to spare the breeding fish, and as salmon do not certainly spawn in the rivers alluded to at this time of year (July), and as they certainly do spawn in the very period when their capture under these Acts was allowed, it is very evident that the enactments referred to were worse than useless; and it is not surprising, therefore, that in a later Act we find Parliament confessing that the "time limited for restraining the taking of fish is not properly suited or adapted to the fishing seasons so as to answer the intentions of" the legislature. Such a mistake as this could not have occurred if the salmon fisheries had been made the subject of systematic investigation prior to legislation.

Fortunately we do not live in quite so much darkness as existed at the time these Acts were passed; or, to take another instance, at the time when an Act of the reign of George II. based an enactment regulating the capture of lobsters on the notion that, as the preamble of the Act recites, "lobsters crawl close to the shore to leave their spawn in the chinks of the rocks, and as much under the influence of the sun as possible."

But we need not go back to the beginning of last century for examples of hasty legislation on imperfect information. In 1809 a law was passed limiting the size of mesh for herring-nets in Scotland to one inch. This law took no cognizance of the fact that the one-inch net would not catch the sprats, the fishery for which, in the Firth of Forth, was closely associated with that for herrings; and the industry of the sprat-fishers was consequently seriously interfered with. When, in 1851, all nets except drift-nets

with a one-inch mesh were prohibited for the capture of herrings, the sprat-fishermen, who used scringe-nets, were threatened with the extinction of their industry, and the herring-fishermen on the west coast of Scotland, who used seine-nets, were in a like plight. A few years later an Act was passed fixing a close time for herring on the west coast of Scotland—an enactment which experience has proved to have been perfectly unnecessary for the protection of the fish. The enforcement of these laws was the cause of grievous hardship among the fishermen, and serious disturbances occurred in consequence. But it was not till 1868, after three separate Commissions had inquired carefully into the matter, that these restrictions were condemned, and formally abrogated by Act of Parliament.

Another instance of the dependence of wise legislation upon accurate practical knowledge of the habits of fish may be found in the case of the outcry against trawling. The principal ground of the objections originally urged so loudly against the use of the beam-trawl—that net which, shaped like a long wide-mouthed purse, is dragged along the bottom of the sea, ensnaring the soles, plaice, turbot, and other bottom fish—was that it destroyed the spawn of different species of fish, particularly that of the herring, the cod, the haddock, the whiting, and so on. Now it so happens that the spawn of the herring is deposited at the bottom of the sea, resting there often in enormous masses, resembling very closely, in appearance and consistency, a tapioca pudding. The fishermen jumped to the conclusion that the spawn of every other fish was deposited in the same way, and, as sometimes a trawl would be found to contain small quantities of herring-spawn, the cry was at once raised that the trawlers were denuding the ocean of fish.

Those interested in the long-line fishery, with which the trawl competed most directly and most successfully, joined in the outcry, and the complaint was pressed most strongly upon the attention of the Royal Commission appointed to inquire into the Sea Fisheries of the United Kingdom in 1863. That Commission failed to be convinced by the arguments brought against the use of the trawl, and most wisely declined to interfere with it. Their action has since been most unexpectedly and most completely justified by a discovery made by Professor Sars, who, while investigating the condition of the cod-fisheries off the west coast of Norway, found that the eggs of the cod were not deposited at the bottom of the ocean, like those of the herring, but floated freely on the surface of the water, where it is obviously impossible for a net, dragging along the bottom of the sea, to affect them in the slightest degree. It has since been shown that the eggs of the haddock—which belongs to the same family as the cod—and of the mackerel—which belongs to an entirely different *genus*—also float on the surface, and the case against the trawl therefore, as destructive of the spawn of these three fish at least, has been completely disposed of. It has been disposed of in an equally satisfactory manner as regards the herring, by the enormous increase which has taken place in the yield of the herring fisheries, the number of barrels of herrings cured in Scotland alone having steadily increased from 130,000 barrels a year in the early years of the century, till it now exceeds 1,000,000 barrels a year.

But within the last few years, instead of having to rely on the wind for their means of propulsion, many trawling vessels have been fitted with steam-engines, rendering them independent of wind and tide, and increasing many times their fishing power. The employment of steam has revived

the outcry against trawlers generally, but the complaint against them is somewhat modified. In some quarters the old belief in their injury to the spawn still survives, with the usual tenacity of life with which all mistaken notions seem to be endowed ; but the charge practically resolves itself into one of destroying, not the spawn or eggs, but the fry or young fish. No trawler will deny that his net does destroy a large quantity of immature fish ; but that admission is by no means a conclusive proof of his guilt. The charge has no significance, unless it means that the destruction of young fish which he occasions has the effect of diminishing the supply of adult fish. It is as easy to deny as to make this charge ; but it is a much more difficult matter to prove either side of the case. If the charge of causing the deterioration of the fisheries embraces the cod, ling and haddock, and other members of the cod family, it may be answered by referring to the vast development of these fisheries, as shown by statistics, in spite of—probably largely in consequence of—the use of the trawl. But if the allegation that the fisheries are decreasing be confined to the fish which are chiefly taken by the trawl, viz. the flat-fish, such as soles, turbot, flounder, plaice, brill, &c., it is less easily disproved, for the reason, first, that we have no such statistics of the quantities of these fish captured as we have in the case of cod and herring ; and, second, that our knowledge of the habits of the *pleuronectidæ* or flat-fish is even more meagre than our acquaintance with the natural history of the *gadidæ* or cod. The probability is that the flat-fish are no less prolific than other species ; we know, indeed, that one of them, the turbot, is one of the most prolific fish known ; and it is equally probable that the destruction of small flat-fish by trawl-nets bears no greater relation to the depredations among them of

their natural enemies than the wholesale destruction of herrings by the herring fleets has been shown to bear to the havoc which other enemies besides man work among them, and that is that it is infinitesimal.

It is very doubtful whether the destruction of small fish by trawlers is at all comparable to the destruction of small fish by shrimpers, and, above all, by the whitebait fishermen. Now it is very certain that a shrimp dredge catches more shrimps than small fish. If it did not, I fancy we should hear a very loud outcry over the decay of the shrimp fishery. If the shrimp trawlers therefore, catching enormous quantities of one, or at the most, two kinds of crustacean, do not exhaust the supply of those two animals, can it be seriously argued that they will do much towards exterminating, not one, nor two, but a dozen different kinds of sea-fish, of which they capture a far smaller quantity, which are all of them far more prolific than the shrimp, and all of which make the shrimp their prey, while the shrimp can do little or nothing in retaliation? If, again, the trawlers are to be disestablished because they are annihilating our fisheries, surely the whitebait fishermen must be included under the same ban. Numbers of men fishing month after month, every year, not incidentally, but of malice aforethought, for the young of herrings, sprats, and other fish, in a single estuary, must surely do a great deal more damage than even a much larger number of men fishing in the deep sea and catching young fish only as an incident in their occupation. If the fish in the deep sea are decreasing because of the ravages of the latter class, surely the supply of whitebait in the estuary of the Thames must be decreasing through the destruction occasioned by the former. Yet as a matter of fact it is not diminishing; on the other hand, increasing quantities of whitebait are

eaten every year, not only in London but throughout the country. But it is as fallacious to argue that, because the herring fisheries are inexhaustible, therefore all fisheries are inexhaustible too, as to contend that, because the salmon fisheries are capable of being fished out, unless adequately protected, therefore all other fisheries require similar protective laws. The cases of the salmon and the herring have been proved to demonstration; but there are others that have not, and, as the opponents of trawling have reduced their case to a point on which we have no definite information, the question becomes one for investigation. They claim the prohibition of "inshore trawling," *i.e.* trawling in bays and within a certain distance of the shore, on the ground, first, that trawlers should be kept out of the way of the smaller boats engaged in other modes of fishing; and, second, that the bays are "the nurseries" for young fish. The former point will be referred to later on. As regards the latter, it may be pointed out that there is no proof that the inshore banks and bays are or are not the sole, or even the principal, ground on which the supply for maintaining the stock of fish in the sea is produced. We require to know more of the habits of the fish particularly affected, their times and places of spawning, their migrations, their food, and so forth, before we can arrive at anything like a definite conclusion on this subject. That the question is a many-sided one is evident. The complications of this, as of almost every other, fishery question, were illustrated a few days ago in a Paper read by Dr. Day on the Food of Fish, in which he pointed out that, if the mesh of the trawlers were so arranged as to allow all small soles to escape, the smallest sole of all, *solea minuta*—an insignificant and worthless creature never exceeding when full grown three or four inches in length—

would be left to increase and multiply unchecked, to consume the food on which the more valuable species live.

Just such another and even more striking instance is afforded by the history of the oyster fisheries. Those who advocate the total prohibition of dredging in close time, and of the carrying ashore of undersized oysters, forget that in the one case the star-fish and the dog-whelks would be left to settle on the oyster beds like vultures round their prey; and in the other (as Mr. Huxley has pointed out) the oysters with tender shells, which would most surely be attacked and could most easily be destroyed, would be left for the star-fish and dog-whelks to fatten upon, instead of being brought ashore and laid down on suitable beds, and fattened for the use of man.

On this question of star-fish and other enemies of fish, there is much room for the diffusion of useful knowledge among the fishermen. The trawl-net, for example, often brings up, besides its wicked load of small fish, large numbers of star-fish, "tingles," and other vermin which would escape if the mesh were enlarged. When out trawling I have often seen the fisherman, when casting overboard his rubbish, tear a star-fish in two and throw it away with a by no means complimentary valediction. What has such a man done? Instead of casting back one star-fish he has returned two to the water, for this creature has the power, if not of replacing its lost members, at least of living very comfortably *minus* one or two; and if the star-fish does not grow a new finger, the finger may be said to grow a new star-fish. A bucket of hot water would effectually close the career of such creatures, and fishermen should be instructed to absolutely destroy all kinds of vermin. In France, in the agricultural districts, may be seen hung on the walls of the public schools notices conveying

in a few words some bit of practical information, such as "Spare the ladybird ; it is a friend to the farmer." In some such way might be distributed among the fishermen's rooms, and on board their boats, cards with, among other things, the warning, "Destroy the star-fish ; it is an enemy of the fisherman." Instead of casting their vermin overboard the fishermen should bring them ashore, where they would make very good manure for their gardens. A fisherman, going to cultivate his potato patch on his return from fishing, would not leave a fine row of healthy thistles to grow and scatter their seed over his and his neighbour's gardens to the detriment of his crop ; neither would he pick up a slug from one part of the garden to cast it on to another. As he would kill the slug, and uproot the weeds instead of merely cutting off one head to let another grow, so he should destroy the vermin he may find on his fishing-ground.

If all the fishermen agreed to bring ashore all the rubbish they collect at sea and the entrails of the fish they gut on board, they would enable local establishments to be started to utilise all this offal as manure, and thus convert what is at present not merely a waste, but a harmful, material into a source of wealth. In some cases, for example, dog-fish are occasionally met with in such enormous shoals, mixed up with other fish, as to make the fishing in the fishermen's estimation worthless. If they knew that in killing the dog-fish they were benefiting the fishery, even if they did not receive any very high price for them for the sake of their oil or for the preparation of manure, they would surely rather bring them home than leave them to go free like wolves among their flocks.

In directing attention to such matters as these—which must commend themselves with especial force to those who

advocate all sorts of protective legislation for the sea-fisheries—the proposed Society would find a large and useful sphere of operations. Such work would form a necessary part of its larger duty of examining into all questions affecting the productiveness of the fisheries and the direction man's operations should take in developing them.

Many of these questions are matters requiring years of incessant study. In the meantime, however, we may arrive at something like a practical solution of the problem in a shorter way by collecting accurate statistics of the quantities of each kind of fish caught every year, and of the number of men engaged in the various fisheries, together with the area of netting or the number of hooks employed by them.

The Legislature would then have something tangible upon which it could decide whether to accede to, or to resist, the demands of the fishermen for the suppression or regulation of this, that, or the other method of fishing. But it is not merely on the point—essential as its consideration is—whether the yield of any kind of fish is diminishing or not, and to what causes—natural or artificial—such diminution is attributable, that a National Fisheries Society could render a national service. The question of “police” is largely involved in the allegations which one class of fishermen urge against another. If the line-fishermen were not affected by the competition of the trawlers, or the seiners by that of the drifters, and so on, and if there were none of the unfortunate occasions for complaints of injury done by one kind of gear to another, which occur from time to time, I venture to think we should hear less of the harmfulness of the new modes of fishing. But it is essential that no lawful mode of fishing should be needlessly or wantonly interfered with by

another, and, just as the policeman who stops your cab at the street corner, to allow a cross current of traffic to pass, is justified in thus interfering with your freedom of movement, so the Government is justified in regulating the movements of fishing-boats at sea. Indeed it would fail in its duty if it did not do so. It follows that the more intimate acquaintance with all the intricacies and technicalities of the different modes of fishing, which would result from the labours of the proposed Society, would be of great service in enabling those regulations to be framed with due regard to the special requirements of every branch of an important industry.

As I have already pointed out, one of the greatest evils to which any industry can be subject is that of spasmodic legislation—legislation framed to meet a popular cry of the moment. Among a certain class of people whose view is bounded by the horizon of their own particular standpoint, a demand for legislation is heard on every imaginable pretext. Soles are scarce: then trawlers must be abolished. A “salmon disease” appears: therefore the salmon fisheries will be ruined unless power is given to “stamp out” the plague. Oysters are dear: hence dredging must be put a stop to. The pilchard fishery is a failure: so drift nets ought to be put down. Of the evil effects of legislating in a scare we have had recent experience in the case already referred to of the Scotch herring fisheries. By “keeping touch,” to use a familiar phrase, of the whole question of the fisheries, not only in our own country but in every other part of the world, a National Society would be able to gauge the real value of popular cries like these, and, always feeling the pulse of the patient, could furnish the data upon which the doctor could judge whether a surgical operation, or a dose of medicine, or a mere relaxation from restraint, was necessary.

On the other hand, there may easily occur cases in which the interests of the fisheries are in danger of being overlooked from the want of some Argus-eyed body watching in every direction for anything that may, directly or indirectly, affect them for good or for evil. If a National Fisheries Society had existed in the middle of last century it is very improbable that the weirs, which then began to multiply in all directions, would have been allowed to establish themselves without some stand being made on behalf of the salmon fisheries. I have elsewhere endeavoured to show that, when the introduction of pound locks, a hundred years ago, transformed weirs from an obstacle to navigation into an aid to inland navigation, the resistance which had been offered to dams ever since the time of Magna Charta, partly for the sake of the fisheries, but more particularly on behalf of the freedom of river navigation, suddenly changed into a zealous advocacy of these structures, on account of the service they rendered, with the help of navigation locks, to the boating interest. The fisheries were forgotten, with the result that from this, among other causes, many rivers were entirely denuded of salmon, and the rest brought to the verge of exhaustion.

The same with pollutions. As mining and manufacturing enterprise grew in this country the interests of the fisheries were more and more neglected. Little by little the evil of pollutions increased. One small factory or mine, whose refuse was a mere bagatelle, formed the nucleus of a vast collection of industrial works, the united volume of whose filth was sufficient to poison a whole watershed. It would be not the least important object of a Society devoting itself to the interests of the fisheries to guard in the future against similar agencies inimical to the welfare of the fisheries, and to seek to devise remedies for those from

which they already suffer at the hands of other interests. The fishing industry is so closely identified, either to its detriment or to its advantage, with so many other interests—mining, manufacturing, agricultural, navigation, sanitary—that an almost illimitable field lies open for the watchful operations of a National Fisheries Society. I have not space to refer to the way in which the Society could aid the fisheries by directing meteorological research in organising a system of storm warnings; by pointing out improved means of communication between fishing-boats and the shore, and, by telegraph or otherwise, between localities where fish may happen to be, and the ports where the boats may happen to be lying. These and many other subjects will suggest themselves as fit points to engage the attention of such a body.

It may be said that, in many of the questions referred to, such a body would be usurping the functions of the Governments. I venture to think that the Government would be well advised if, imitating the example set by the Governments of Canada and the United States, it were to consolidate or affiliate the various departments charged with the administration of the fishery laws, enlarge their functions, and enable them to study and deal with the various questions connected with the fisheries in a comprehensive manner. If it did no more than provide machinery for the collection of accurate and detailed statistics it would be taking a comparatively small but most important step. At the present moment the only fisheries of which we have anything like really useful statistics are the Scotch herring fisheries; less complete returns are furnished of the cod and ling fisheries of Scotland; and approximate returns, of a very imperfect character, are supplied in regard to the English and the Irish salmon

fisheries. Beyond this all is mere conjecture. In the traffic returns of the railways, in the dealings of our large London and provincial markets, lies the only possibility of a private body collecting statistics relating to the fisheries. But the Government might easily employ the coastguard and the custom-house officers to gather detailed information of the utmost importance, and the system of registering fishing vessels might probably with little difficulty be extended to the tabulation of returns relating to their catch, and details respecting their outfit, &c.

But, whatever the Government might do, such a Society as I propose should take some such position in relation to fisheries as the Royal Agricultural Society holds in regard to agriculture, the Royal Botanic and Horticultural Societies in relation to horticulture, or the Royal College of Surgeons in relation to medicine. Nay, more. I venture to think that it would have a claim to State recognition, and that a really earnest effort to establish such a Fisheries Society would encourage the Government to extend to it the same support which it has accorded to the great national Institution across the road—the Science and Art Department—and to that right Royal Institution at Kew, which has aims in the field of agriculture akin to those which we have in the fisheries of the waters.

Whether supported by the State or not, the success of this great Exhibition augurs well for the future of a great National Society established to carry on the work which, begun at Norwich, through the exertions of our far-seeing and energetic chairman, has under the same able guidance, with the distinguished patronage of Her Majesty the Queen, and with the personal co-operation of H.R.H. the Prince of Wales, and other members of the Royal Family, been carried to so auspicious a consummation in this building.

Without venturing to suggest any elaborate scheme for the constitution of such a Society, I may in conclusion attempt to enumerate the salient features of its work.

First of all, the Society should be the repository of every kind of information, practical and scientific, relating in any way to fish and fisheries. In the archives of many of the learned societies of the metropolis and of the provinces are hidden away vast stores of useful knowledge concerning the fisheries, which should be brought under one roof, where all persons seeking information could depend on assistance in making themselves acquainted with everything that had already been done before them. Round the coasts, on the banks of every stream, live hundreds of observers, some of them skilled in recording facts bearing on a particular branch of the subject, others only wanting such direction and encouragement as the Society would afford to become earnest and intelligent workers in the practical development of the fishing industry. Fishermen and others should be encouraged by the offer of prizes to record their observations; and, when they have proved themselves capable and efficient workers, by small occasional or regular grants, to work up special subjects. Systematic records of the temperature of air and water, the state of wind and sea, the nature of the bottom, the presence or absence of particular weeds, the movements and abundance or scarcity of fish, the contents of their stomachs, their condition in regard to fatness and the development of spawn, their growth, their enemies, their parasites, their companions, and of many other points, should be made day by day all round the coasts. Men of proved capacity, and enjoying the confidence of their neighbours, should be appointed for particular districts, to direct, encourage, and assist the fishermen both to give and to seek information

concerning fish and aquatic animals and plants, the modes of catching, increasing, preserving them, and transporting them to market, and the various uses to which they can be put, either as food, or in the preparation of drugs, oils, manure, and other products. Finally the Society would be able to arrange for periodical Fishery Exhibitions to be held at various points around our coasts, thus giving the fishermen on the spot the opportunity of learning those valuable practical lessons which, to many of them, are of far more use than learning imparted by books : and thus it would realise the hope expressed by the Royal Commission on Sea Fisheries, and emphasised by Mr. Huxley in his Inaugural Address in this building.

In all these details the functions of the Society would be purely educational. It should stand at the very antipodes of any scheme for fostering the fisheries by any system of bounties, of premiums, of loans, or in any other way than by encouraging research, and directing practical enterprise.

It would educate the fisherman to prosecute his calling in the most thorough and intelligent manner, and with the most suitable appliances ; the boat-builder and nautical outfitter to give the fishermen the most roomy, seaworthy and convenient vessels for the purpose ; the curer to prepare the fish in the simplest, most economical and most effective manner for the different markets ; the legislator to frame wise laws for the regulation and, on good cause shown, for the protection of the fisheries, and, while protecting the fish, not to forget the duty of affording protection to the lives of the brave men who run such risks in their arduous and honourable calling ; and last, but not least, it would educate the public generally to insist on proper facilities being given by railways, market

authorities and others, for the distribution of the fish caught at such infinite trouble, to find good qualities in fish which they have been apt to despise as "offal," and, when they have bought it and paid for it, to cook it with some regard for its value, after the enormous labour it has cost to bring it to their doors.

DISCUSSION.

Dr. FRANCIS DAY said the Paper which had just been read would commend itself as showing what was required for the fisheries of this country. There was only one thing he had to remark. It appeared to him that something similar already existed, for he thought the Chairman presided at a meeting held at Fishmongers Hall last year, and several gentlemen now present were at the same meeting, when a society was formed, such as Mr. Fryer now proposed to inaugurate. He should almost have thought that Mr. Fryer was ignorant of that society, but when he looked at the names of the council, he found amongst them Mr. Fryer himself; and, therefore, it appeared to him that both Professor Huxley and Mr. Fryer must have taken their views from the prospectus of the National Fish Culture Association, which he held in his hand. It was true that Mr. Fryer proposed to alter the name of the Association into the National Fishery Society, a proposal which he had himself made on the day the society was inaugurated, with the exception that he suggested National Fisheries Institution. Passing on to the question of sea fisheries, it was evident that Mr. Fryer held the opinion that those who thought the sea fisheries were being overworked were raising a false alarm, that in fact the

only persons to be listened to were the Royal Commissioners, who had proposed to do away with all limits and regulations. Still he felt sure he would allow him and others who had been working at fisheries for years to hold their own opinions. Having heard what fishermen had to say all round the coast, he thought, with very few exceptions, they ran perfectly contrary to those enunciated by Mr. Fryer. He would like to ask one or two questions. In the first place he had informed them that the question of the herring fishery was quite worked out, and everything with regard to it was known. Now, one of the most important questions was this, they must all admit that the herrings on the east coast of Scotland were going farther out to sea, and were depositing their spawn in 40 or 50 fathoms or more of water, and he did not know whether the Fishery Department had instituted any experiments to ascertain the effect of this, but if they had, he should like to know first, if the spawn of the herrings sank to such a depth in the sea whether it would hatch or not ; and secondly, supposing it did hatch, what would be the result of the super-incumbent weight of water on the young herrings : would they rise to the surface or remain at the bottom ? Again, supposing the young fry were hatched and came to the surface, would they be as safe out at sea as if they were hatched nearer in shore ? With regard to killing the vermin, such as dog-fish, and so on, if everything were going on in such a satisfactory manner, and the balance of nature remained, why was there so much necessity for killing the vermin ? surely they were only part of the fisheries. Then there was a little practical remark which to him was quite new. They were told that star-fishes were not sufficiently killed by the fishermen, and the proposition was that each vessel should have a bucket of hot water for

the purpose of killing them. Now, he had been on fishing-boats a good deal, and he thought the fishermen would say that a far easier plan would be to put the heel of his boot on the top of the fish and crush it ; as to carrying buckets of hot water about in trawlers to kill starfish it was not a plan which, in his opinion, the fisherman would be likely to take to. Then, again, strong remarks were made about what fishermen said about the spawn ; but the word spawn has a little altered its meaning of late years. In old works it appeared over and over again, and he thought, even in papers read there, it was evident that spawn in fishermen's language meant either the ova or young of fish : so that fishermen had not changed their views upon this point. On turning to the late Mr. Buckland's and other reports, it would always be found that the word spawn meant the young of the fish as well as the eggs. Coming back to the question of the society which was proposed, and which he believed all would wish to see, viz. a fishery society for the purpose of collecting information respecting fish and fisheries, he understood that Mr. Fryer intended that it should tell the fishermen what to do and what to leave undone, but it was to be careful not to propose to foster the fisheries. He was not exactly sure what was meant by not fostering the fisheries. Did he mean they were to have nothing to do with artificial propagation of food-fishes, or did he mean pecuniary assistance ? If he meant that nothing was to be done with reference to the raising of the young of food-fishes, he could not help thinking that he was taking a very erroneous view. One of the most important questions for consideration at the present time was whether or not it was advisable to hatch marine fishes artificially, and in that way to stock the in-shore waters. He imagined that questions of fisheries

and statistics, and information of what fishermen should do, would naturally fall to the lot of the Fisheries Commission, and that the returns received from the Fisheries Board would contain accurate information, such as was received from the Commissioners of the United States, Canada, and other countries, and he must confess he was rather surprised to hear the statement made that these annual returns were only approximate, and of a very imperfect character.

Mr. O. T. OLSEN (Grimsby) said that when the late Mr. Buckland was alive he worked in conjunction with him to some extent, and they sent out a log-book for the purpose of gathering information from fishermen themselves. Since the death of Mr. Buckland he had continued sending out these log-books, some of which were in the exhibition. It was of the greatest importance to get information from practical men. It appeared to him by the establishment of such a society they would get theoretical knowledge only of fisheries, but by the assistance of fishermen themselves they would get practical information, such as he had received personally, but which now may appear theoretical. To establish a society for the purpose of carrying out these investigations would, he feared, entail a great deal of expense. He had proposed it more than once, but he saw the difficulty inasmuch as it would be only the members of the society who would have to bear the expense of collecting and distributing information for the welfare of the whole nation. About twelve months ago, Mr. Chambers informed him that a society was to be formed, which afterwards was named the National Fish Culture Association. That name he did not altogether approve of, but considering the objects of the Association as set forth in the prospectus he thought it did not matter much about the name. Would it not be possible to alter

that name in some way, if considered necessary, and make this the National Fish Culture Association, a groundwork or the foundation of a National Fisheries society as was now proposed? He belonged to a society in Norway for the promotion of Norwegian fisheries, and he thought such a society would work here very well if the means were forthcoming. That was the great difficulty in Norway. They had sent over several men to this country to collect information, and it was found to bear very heavily on their funds. He had also been thinking of a plan by which the fishermen themselves could carry out the object. Supposing this society were to establish a fund, and make loans to the masters of fishing-vessels to enable them to become shareholders or like a co-operative society. The master himself would work the vessel, he would have some pecuniary interest in it, say only a sixteenth part. Suppose a vessel cost £1,600, which was the cost of a good-sized trawler fully equipped; if £100 were advanced to the master he would have a sixteenth share, in addition to his usual earnings, the dividend should not be drawn but to go towards paying off the £100. As soon as that was done another £100 might be advanced him, and so he would go on increasing his capital or shares in the vessel until he became the sole owner. This would cement fishermen to their trade. It would make them more industrious, because they would then have an interest in their own vessel to work for. They would look after the fisheries, and they might be made their own policemen. These master-fishermen would bring information even from the bottom of the sea, Papers could be read locally which afterwards might be printed and circulated. In connection with the same scheme an insurance fund should be started both for the vessels and for the lives of the fishermen, which would

have a tendency to stop or reduce the continual subscription lists which were now going round. In this way they would also be establishing an agency, which would maintain the supply of the metropolis and other large towns with fish, without the necessity of so many intermediate hands which made the fish dearer. With regard to small fish and in-shore fish he believed fishermen would be glad to be their own police in this respect, to prevent the wilful destruction of small fry ; they would regulate the mesh, and adopt such regulations as were necessary. They did not want to catch small soles or plaice, but if one did it the others thought there was no reason why they should not. He hoped the society would be formed in connection with the National Fish Culture Association, but it should be national, not international.

Mr. OLDHAM CHAMBERS had listened with great pleasure and attention to the Paper, having taken a considerable amount of interest in fishing and fisheries for some years past. He certainly could not forget the large and distinguished meeting held in Fishmongers Hall at the end of last year, under the auspices of the Fishmongers Company. There a society was inaugurated, called the National Fish Culture Association, under the presidency of the Marquis of Exeter. No doubt Mr. Fryer would enter a disclaimer to any wish to interfere with the objects of this Association, of the Council of which he was a member ; but, on turning to the objects of that Association, he found they were very similar to what was now proposed. They included "to encourage and develop the sea and inland fisheries of the United Kingdom, and thereby increase the food supply of the country by collecting, arranging, tabulating, and publishing in periodical reports information for this and other countries on fish culture and

fisheries, by promoting the formation of libraries, aquaria, and schools for studying the science of ichthyology and fish-culture, and by the formation of a library and museum, and by holding meetings for the discussion of subjects connected with fish, fisheries, and fishermen." Again, "by encouraging and rewarding fishermen and others, to assist in carrying out investigations and observations on the temperatures of the sea, spawning-grounds, food, habits, migrations, and enemies of all marine fish; by collecting and tabulating information on the effects and various modes of fish capture in lakes, rivers, estuaries and seas, and by suggesting remedies for those modes which have proved to be injurious." Those objects, he must say, were identical with the objects of the society proposed by Mr. Fryer, and it appeared to him he had not treated the association with the courtesy which might be expected. If he thought the walls of the association were not sufficiently large, he was quite sure the council would have listened to any proposition he might have made for an enlargement of its objects and the increase of the benefit they hoped to confer on the fisheries. Mr. Fryer had alluded to the great increase of the herrings caught on the coast of Scotland, and there was no doubt in that he was perfectly correct, but it appeared to him they ought to have statistics, not simply of the number of fish brought into harbour, but also of the increase of those vessels on the fishing-grounds, and the improved methods of catching fish now practised, together with the new system of transport. All these things tended to greatly increase the number caught as shown in the statistics. Again, Mr. Fryer alluded to the trawl fisheries. He could only say that many times he had seen the trawl net brought into the vessel containing a fearful number not only of spawn of food fishes, but of immature fish.

Surely the exhibition had done a great work in offering a prize for the best net for the prevention of this great disaster. Undoubtedly among the large number of the pleuronectidæ family there were a great many *solea minuta*, but at the same time there were a vast number of common soles both in the embryo and immature state, and something ought to be done to put a stop to this destruction. He hoped Mr. Fryer would pardon him the remarks he had made, but he was sorry he had proposed this new association, and would have much rather he had brought forward some scheme whereby the National Fish Culture Association would have been enlarged and improved.

Mr. R. B. MARSTON said it was unnecessary for him to add anything with regard to the position of the National Fish Culture Association, but with regard to trawling he should like to ask a question or two. There were two sides to this question, they often heard that trawlers did no harm whatever, but if such was the case the question often occurred to him why was it that year after year the fishermen had to go farther away to catch the fish. It was quite possible there were a quantity of fish in the ocean which could not be exhausted, but it was also possible they might be beyond the reach of the markets, and if so it was practically useless. He should like to ask also with regard to the proposed society whether Mr. Fryer had not the idea in his mind that the National Fish Culture Association might be increased in some way to cover the field he desired.

Mr. WILMOT said the subject of a National Fishery Society was a very important one, and one which should have been taken up by this country many years ago. Had that been done there would not have been the present outcry about the want of fish, for it would have brought such force to bear on the Legislature as to cause it to

undertake the protection of fisheries more liberally than it had done. The remarks which had fallen from Mr. Fryer in many points were exceedingly good, but coming as he did from a far off country, where the protection and production of fish was advocated very largely, he regretted that the Paper had not touched on that subject. He did not recollect a syllable was mentioned with regard to protection or production of fish, but that was one of the most prominent features in connection with the requirements of the fisheries. In Canada there was a Minister of Marine and Fisheries whose duty it was to look after this important work. Previous to the confederation of the Provinces each Province had some sort of law for the protection of the fisheries, but they were so abortive as to prove useless. At the time of the Confederation, however, when the seven Provinces were brought together, it was deemed so important that the fisheries should receive protection that a Cabinet was formed for the purpose, which had been of vast service in bringing about many things which otherwise would not have been accomplished. Statistics were obtained from the fishermen, the fishery officers, and various other sources, which were collected and submitted to Parliament annually, and Parliament legislated on any improvement which might be required for the purpose of advancing the general interests of the fisheries or the fishermen. It seemed to him extraordinary that in a vast and intelligent country like Great Britain the Government had not taken up this great question of protecting, improving, and advancing the interests of the fisheries, a step which had been taken by Canada, the United States, and many other countries. It seemed to him a mistake to leave such an important matter to individuals. No doubt great benefits would result from this exhibition and the Papers and discussions connected with it,

and he hoped the question would be brought before Parliament, for he had heard the Chairman himself say it was the duty of Parliament to take it up. Notwithstanding everything that had been said, he contended that the fisheries were decreasing. Even though a million barrels of herrings might be collected to-day, and at the beginning of the century only a quarter that number were taken, it would not follow there were any more fish. It was the reverse; because the fishermen had to go further to get them and to employ ten times the amount of wealth and ability, and a hundred times the appliances which were formerly applied. He contended that until some means were instituted by which fish could come nearer to the coast to carry out the laws of nature in reproducing their species they would be gradually exterminated. He knew of no kind of fish which did not come nearer the coast when laying eggs than at any other times. They were out in the far depths of the ocean feeding, but when spawning-time came they approached the shore and protected places; and if man by his greed was determined to kill these poor creatures, the authority of Parliament ought to step in and prevent it. If such a course were not pursued, before half a century the larger proportion of fish which now frequented the coast would be destroyed, and none would be found at all. In Canada there were large expanses of water, 200 to 300 miles in length, in which the fish had been nearly exterminated. He thought the idea of a National Society was a good one, but they should go farther, and apply to the Government of the country to establish some department which should encourage the fishing industry by protection and propagation.

Professor BROWN GOODE had great pleasure in proposing a vote of thanks to Mr. Fryer, who was to be congratulated for more reasons than one upon his Paper.

It was a well-known principle that views on important subjects which evoked no opposition were of very little value ; and, in addition to many important ideas which had been suggested by Mr. Fryer—some of which he endorsed, and on some of which he might have had something to say if there had been time—the discussion which had been elicited was also of importance. In fact, the great object of these gatherings was to cause such discussions, and to get the people of the country thoroughly alive to the meaning of all these vital questions connected with fishery economy. The objects which Mr. Fryer had proposed were all exceedingly praiseworthy, though he agreed with Mr. Wilmot that he ought also to have referred to an object which was of equal importance—that of fish-culture. At the same time the collection and diffusion of knowledge, and the proper utilisation of the fish supply were all exceedingly important. Whether this could be safely left to a Society or not was a question for each Government to determine for itself. The people of the United States would not feel safe in committing an interest of such great importance, which related not only to the interests of fishermen but to those of everyone in the country, to the care of the few individuals who might or might not take an interest in it. Twelve years ago, the carrying out of these important objects was in the United States committed to an executive official who was of equal importance with the Minister of Agriculture. He did not propose to enter into those questions which had been touched upon by the gentleman who had preceded him, though the one referred to by Dr. Day was exceedingly important, namely, the question whether the eggs of those herrings which spawned far out at sea were hatched, and whether the young fish would thrive as well as those hatched nearer shore. Now,

in that connection he must state that on the American coast they had a fish closely related to what was called hake in England. In the deep sea explorations carried on by the Fish Commission, this fish, which was during its adult life a surface species, found about the shores, was found spawning at a depth of 100 fathoms, and not only did the eggs appear to hatch perfectly well, but the young fish were found in myriads at that depth and thrived well, although the adult was not in any sense a deep-sea fish.

Mr. MONDEHARE had great pleasure in seconding the vote of thanks, and congratulated Mr. Fryer on the sound practical idea he had submitted to the meeting. Whether there had been such a society started beforehand or not, he had to be thanked for bringing it forward thus publicly. He considered the proposal made by Mr. Fryer was really an international one. The Society already started was English in its management and constitution. The larger Society would be an international society, because the information to be obtained and the measures proposed or adopted would be known in foreign countries, and would be news to fishermen all over the world. There were other works of this international character, one in particular, which had been much talked about lately, which was French in its origin, and yet was really an international work, and this would be the same. It therefore gave him the greatest pleasure as one of the foreign delegates to approve of it.

The CHAIRMAN in putting the resolution said allusion had been made to the National Fish Culture Association, and he was sure nobody was a more hearty supporter of that association than himself, as would be believed when he informed the meeting that he was on the Executive Committee. Certainly, if he had any doubt in his own mind

in regard to Mr. Fryer's proposal interfering in any way with the Association, he should not have presided at this Conference, but as far as he understood from Mr. Fryer, and certainly from the paper he had just heard, he gathered that what Mr. Fryer desired was more that there should be some central department to which those who were interested in and connected with the fisheries of the United Kingdom should be able to communicate, and which did not now exist in any way. In his experience, especially during the last four or five years, whenever he had to make any communication with the Government with respect to fisheries, there was always a doubt to what department to go to—whether to the Home Office to ask a question of the Inspector of Salmon Fisheries, or to the Board of Trade to ask Mr. Cecil Trevor relative to depredations by foreign or English vessels, or a question on oysters, or in connection with the foreshore, or to Mr. Gray, if it were concerning grievances respecting the lights for fishing vessels, and other matters. There was no central authority whatever to go to. Now, if he wanted any information with regard to the United States, he should at once communicate with his friend, Professor Brown Goode, or Professor Spencer Baird; if with regard to Canada, he should go to Mr. Wilmot; if connected with German fisheries, he should go to the Deutsche Fischerei Verein; but here in England there was no central authority to go to, and that, he understood, was the main object of Mr. Fryer's proposal. In numerous cases he had found that the Government of the day—it did not signify what Government it was—seemed to legislate first and then to hear the fishermen's complaints with regard to legislation which had been passed. He had found it so to his own cost, for one of the most important questions which had been under discussion for several years



was the matter of fishing-vessels' lights in an international point of view. All the maritime countries of the world looked to England to devise the best system of fishing-vessels' lights, and yet it was actually the fact that the system of lights arranged in England was proved by the Select Committee, which he persuaded the House of Commons to grant, to be one which could not possibly be carried out. That was proved beyond doubt, for the Government witnesses that came before the Select Committee had to acknowledge that they had had no experience whatever with regard to fishing-vessels, and had never been in a fishing-vessel at night. He himself cross-examined them at considerable length, and in four cases he remembered the Government witnesses acknowledged that they knew actually nothing about fishing-vessels. That was the way in which legislation was carried on, and he did think it was of paramount importance that there should be some government department, or some association, whose objects were far wider and greater than those of the National Fish Culture Association, which he was proud to belong to. He was convinced that all the Foreign Commissioners would confirm what he had said, that in a great maritime country like England, whose fisheries were of such importance, this want ought to be supplied.

(The vote of thanks having been carried unanimously),

Mr. FRYER, in responding, said he had not only to thank the meeting for the kind way in which the motion had been proposed and received, but also to thank those gentlemen who had been so good as to criticise his paper. He had purposely introduced many debatable points, because he felt that, if he made a proposal for a Society to deal with a subject on which everybody was agreed it would fall flat. It would be perfectly unnecessary to have a Society or or-

ganisation to deal with a subject on which everybody was agreed ; but there was no question under the sun which seemed to him to have more sides than the fishery question. If he might venture on a somewhat trite illustration, this was shown by the fish themselves ; there were flat-fish which had a top side, and a bottom side ; there were the so-called round-fish which had a right side, and a left side : then there were fish which were glöbular, or almost so, and were either all sides or no sides at all ; and all the questions connected with fisheries were as many-sided as the different fish themselves. In suggesting the formation of this Society, he did not at all lose sight of the fact that the National Fish Culture Association was already in existence, for he had the honour of being a member of the council ; but if he had suggested that society, as the foundation upon which to build up the very much larger body which he had proposed, he would have been taking an invidious course, as there were others which could make an equally good claim on the score of age, at any rate. Several societies already existed dealing with fisheries from one point of view or another—such as the Fisheries Preservation Society, a body which had existed for some time ; the Scottish Fisheries Improvement Association ; the Rivers Purification Association, and others of a similar kind, besides the youngest and very hopeful one to which reference had been made, but whose title, he thought, limited its work. He should himself certainly hesitate to belong to a society which proposed to take up the question of the culture and breeding of fish by artificial means if it did not intend, first of all, to fortify itself with information as to the habits of those fish ; and, as for the other points mentioned in the prospectus of the association and quoted by Mr. Chambers and Dr. Day, he thought they

were essential to its existence as a practical body formed specially for the promotion of Fish Culture. If, however, it was found that the constitution of this Society could be made the basis on which a larger Society with a wider scope—partaking more of the nature of the Deutsche Fischerei Verein, which had done such good work in Germany—could be established, he should be only too glad to see if he could do what Mr. Marston had suggested and assist in extending its scope. He had the very opposite of any intention to ignore or to conflict with that Society, and he thought that, if his much larger scheme were carried into effect, the Fish Culture Association would find in it, not a rival, but an ally, from which it might derive assistance in the particular work which it was taking up. Several points, which had been referred to by Dr. Day and others, he had omitted, fearing that the Paper would run to too great a length. As to the question of fish-breeding, which Mr. Wilmot suggested he had omitted, he might state that one of his first paragraphs, and almost the last, referred to the “desirability or otherwise of taking direct measures for their multiplication.” Possibly that was a roundabout way of saying that artificial fish-culture should be one of the objects of the Society, but that was certainly the meaning of it; and later on he also suggested that “modes of increasing fish” should amongst other things engage the attention of the Society. As to the points which Dr. Day had referred to, he was perfectly aware of the interesting fact of herrings being caught farther away from the coast; and it was because they had no means of explaining it—and he did not think Dr. Day himself would venture to explain, fully, the whole of the reasons which led to herrings being caught further away from the shore,—that he proposed the Society should take up the

study. As to this fact having any influence on their numbers, he thought that was answered to a certain extent, perhaps not altogether, by the statistics of the Scotch herring fisheries. Where the numbers of herrings caught had increased from 130,000 barrels to over a million, it seemed evident that, though the herrings went farther away, they were not diminishing in numbers, and Professor Brown Goode had suggested another reason for believing that they were not injured by spawning in deep water. On the question of the use of the word "spawn" or "fry," he thought if fishermen used the word spawn and meant fry, it was quite time the distinction was thoroughly understood. The words were used together, both spawn and fry, in ancient Acts of Parliament—"spawn" referring to eggs and "fry" to young fish. He saw that Dr. Day shook his head, but he thought he could put his finger on an Act of Parliament, of the reign of Elizabeth,* where the words were used in the same sentence. On the question which Mr. Wilmot referred to, of small soles being caught in enormous numbers as a proof that the adult soles were diminishing, and of soles and other fish coming close to the shore to spawn, he thought that was a point which required very careful investigation. If soles and all other fish came in to spawn he did not understand how it was that the trawlers near the coast in Torbay and other large arms of the sea did not catch the large fish at the same time as they caught the small. If the large fish came in to spawn they must be there to be caught; but the evidence of the Torbay fishermen was to the contrary. When they

* I have since looked up this Act. It is one of Eliz. cap. xvii. "An Act for Preservation of Spawn *and* Fry of Fish." There are several other Acts, both earlier and later, which support my view.—C. E. F.

came inshore from stress of weather they caught only much smaller fish than they did farther out. That seemed an indication, at all events, that the soles did not come inshore to spawn, but spawned as herrings did, and he hoped with as little ill effect from it, in the deep sea. But all these points were strong arguments in favour of the institution of the society he had advocated. Before sitting down he begged to propose a vote of thanks to Mr. Birkbeck for his kindness in coming to preside on the occasion, which he felt to be a very great honour considering the great calls upon his time, not only in connection with the Exhibition but also with the House of Commons.

Mr. WILMOT seconded the motion with much pleasure, because he understood that Mr. Birkbeck stood foremost in this country with respect to the interest he took in the great fishing industries. He was the inaugurator of the first fishery exhibition, and was Chairman of the Executive of this one which is the International adjunct to that held at Norwich. He had been a member of Parliament for some time and no doubt would remain so for a long time yet to come, and he hoped that before long he would hold an official position at the head of a Government Department which would preside over the interests of British Fisheries, for there was certainly no one more competent to occupy so important a post.

(The resolution having been carried unanimously),

The CHAIRMAN, in responding, said it had given him great pleasure to attend, and he could only regret that his time had been so fully occupied whilst the Conferences had been going on, that he had often found it impossible to be present on several occasions when it would have given him great pleasure to have taken part in the proceedings.

ADDENDUM.

SINCE the reading of the foregoing Paper I have thought it desirable to take this opportunity of removing one or two misconceptions which appear to have arisen as to the scope of the Society whose formation I have ventured to advocate, and especially on the point whether such a Society would necessarily interfere with the work and interests of the "National Fish Culture Association," or of any other body already formed to take up any particular branch of the great question of the Fisheries.

The observation of Dr. Day—which (so far as it relates to Mr. Huxley), did not reach my ears during the discussion—that "both Professor Huxley and Mr. Fryer must have taken their views from the Prospectus of the National Fish Culture Association," is sufficiently disposed of, so far as Mr. Huxley is concerned, by the fact that, (as mentioned by Mr. Huxley in his Inaugural Address which I quoted, and with which Dr. Day was presumably acquainted, either as a hearer or as a reader,) the idea of "an influential Society specially devoted to the British Fisheries," was suggested so long ago as 1866, in the Report of the Royal Commission on Sea Fisheries, of which Mr. Huxley was a member. So far as I am personally concerned, Dr. Day's assumption rests on no stronger foundation. I can only repeat that I was ignorant of the existence of the paragraph in the Report alluded to until I heard it quoted in Mr. Huxley's address; and that the proposal to form a National Fisheries Society had been suggested by me to the Commissioner for Conferences before the opening of the conferences. That I did not derive my inspiration from the prospectus of the National Fish Culture Association will be understood when I say I have always regarded that Association as having been formed for the sole purpose of encouraging "fish culture"—as the statement of its "objects" sets forth—"by founding, promoting or acquiring establishments for fish culture and by aiding or undertaking such experiments as shall seem advisable: by using its best endeavours, with the consent of the authorities, to encourage and assist in the stocking of public and all other available waters which are placed under suitable

regulations, with fish, for the recreation and benefit of the community."

That I am not singular in the notion that the National Fish Culture Association was formed with the exclusive object indicated by its title, is shown by the following records.

In the *Field* of October 7th, 1882, appeared a letter from Mr. R. B. Marston, who wrote as follows: "A month or two ago, Mr. Francis Francis suggested to me that I should get up a National Fish Cultural Association. . . . Mr. Chambers and I have taken the matter in hand, and we shall shortly send out a circular calling a meeting of pisciculturists, and explaining the proposed association, the sole object of which will be the improvement and extension of *pisciculture* in all its branches."

This was followed by a letter in the *Field* of October 14, wherein Col. Stuart Wortley asked, "If Mr. Marston is able to carry out his proposed Fish Culture Association, may I suggest one of the principal points for inquiry and improvement should be the transport of sea fish for *turning down alive?*"

To this Mr. Oldham Chambers replied in the *Field* of October 21, by saying that "The subject not only of the transport of our deep-sea food-fishes, but also of their artificial propagation, has received my attention; and I certainly should not deem the Association complete without it embraced this branch of the science."

In December 1882, a circular signed by Messrs. W. Oldham Chambers and R. B. Marston—a copy of which appeared in the *Field* of December 16—was issued to gentlemen "interested in the subject of fish culture," stating that a meeting would be held at Fishmongers' Hall on December 20th, with the "object" of forming a "National Fish Culture Association of Great Britain and Ireland." This circular proceeds:—"We feel sure you will agree with us that such a society is wanted, and has an immense field open for it. At present all British effort in fish-culture is individual effort, and not only do the public generally know little of what is being done, but our fish-culturists themselves are often quite ignorant of what other labourers in the same field are doing; as proof of this, we may mention the difficulty we have experienced in getting the names and addresses of fish-culturists, and we are aware that there are many whose names we have failed to obtain.

"We know from experience that in this country an increasing interest is being taken in fish-culture and fish-

farming of all kinds: in other countries, including our own colonies, fish-cultural societies are doing most valuable work. . . . It will, of course, be in no sense a commercial undertaking, but purely a scientific society, established on the simplest and broadest foundations, viz., to promote the interests of inland and sea fish-culture of all kinds in the best way possible."

At the meeting held in accordance with this notice, the following resolution was, among others, as reported in the *Field* of Dec. 23, "put and carried unanimously":—

"That in the opinion of this meeting it is desirable that a National Fish Culture Association of Great Britain and Ireland should be established for the purpose of improving and extending the cultivation of our fresh and salt water fishes in the best possible manner."

The other resolutions merely nominated a President, Vice-Presidents, and a Council, consisting mainly of gentlemen "interested in Fish Culture." Not a word was said by any speaker of any other object being in view than the promotion of "fish culture," "pisciculture," "breeding fish," "transplanting the ova," "importation and distribution of ova," "re-stocking," and "operations in ova."

So far as the other "objects" of the Society, as quoted by Dr. Day, and Mr. Oldham Chambers, are concerned, they are merely the incidental and subsidiary means by which the one main object of the Association is to be achieved; and, although they are essential to the proper performance of the functions which the Association has assumed, they are naturally relegated to the end of the Prospectus, of which "Fish Culture" stands in the forefront. As I have already said, I should be sorry to belong to a Fish Cultural Society which did not make itself acquainted with the habits of the fish it proposed to breed, and which did not fortify itself, by inquiry into the condition of the fisheries, and their possible depletion or diminution, with information as to the possibility and necessity of artificial fish-culture as a means of remedying such diminution.

But, after all, the important question is, whether the "National Fisheries Society," which I have proposed, taking up *every* question connected with the fishing industry, would necessarily clash with the interests of existing societies dealing with *single* branches of the subject. It is urged that the proposal I have made is for a society which would be only the National Fish Culture Association under another name. It might as fairly be urged that it would be only a duplicate of the Rivers Purification

Association, or of the Meteorological Society, or of the Scottish Fisheries Improvement Association, or of the Fisheries Preservation Association, or of the Institute of Civil Engineers, or even of the Linnæan Society and other learned bodies; for, in dealing exhaustively with every question relating to fish and fisheries, it would necessarily find some portion of the ground which it proposed to occupy already partially covered in different ways by each and all of these bodies. But there is a large area of vacant ground, not yet taken up, which ought to be thoroughly surveyed, in order that the complex questions affecting the fisheries should be thoroughly worked out from every point of view. A central institution is therefore needed which should not only occupy every inch of ground hitherto unoccupied, but assist in developing what is but imperfectly tilled, and also direct and aid, and at the same time derive assistance from, the operations of societies already diligently working in their own special field. At the present moment there is no such central body in existence, and I doubt if there is any society so organised that it could be expanded to do the work which lies waiting to be taken up.

If it be seriously maintained that there is no room for such an institution as I have proposed, because the National Fish Culture Association already exists, I fail to see how there can be room for a second body specially formed to take up the particular work which the Fish Culture Association has cut out for itself; and I own, therefore, to a feeling of surprise when I find from Mr. Marston's Paper on "Coarse Fish Culture,"* read on June 29, 1883, that he has himself assisted in the creation of such a body,†—the "United London Anglers' Fisheries Society,"—to take up the very work that the Fish Culture Association was formed to carry out, and that he couples the two societies together‡ in a recommendation that they should devote their energies to the "hatching and rearing" of "fry of all kinds of coarse fish for distribution to angling clubs and private individuals requiring these fish."§

* "International Fisheries Conference Paper on 'Coarse Fish Culture,' by R. B. Marston, editor of the *Fishing Gazette*, and member of the Executive Committee of the National Fish Culture Association."
—Published by William Clowes & Sons, Limited, for the International Fisheries Exhibition.

† *Ibid.*, pp. 7 and 10.

‡ *Ibid.*, p. 13.

§ *Ibid.*, p. 11.

I submit, however, that, whether there be many or whether there be few of such associations, the desirability of a great central institution, to take up the whole of the vast range of fishery subjects, is self-evident. Far from finding themselves in conflict with it, the various societies formed to take up any particular branch or branches of the question would see their labours supplemented by, and could in their turn supplement, those of the central body. As the National Fish Culture Association, by affiliating itself, or working in harmony, with the central institution, could continue, under its auspices, its particular work of artificial breeding, so the Rivers Purification Association could be helped to work out the question of remedying the pollution of rivers: the help of the Meteorological Society could be engaged in the study of meteorology in connection with the fisheries and the question of storm-warnings: the coöperation of the Engineers could be secured in working out the problems of fish-ladders and the supply of water to mills and passes: and so on through the list. And as with Societies so with individuals: the labours of particular observers on any subject connected with Fish and Fisheries would be recognised and encouraged, and directed into useful channels. All the interests affecting or affected by the fisheries would be represented in the Central Society; of this central body existing societies taking up special subjects could form branches or committees, as it were; while other branches or committees would be appointed to deal with the many separate objects not hitherto represented in any form.

C. E. FRYER.

August 2nd, 1883.

RIVER POLLUTION

BY

REFUSE FROM MANUFACTORIES AND
MINES;

TOGETHER WITH SOME REMEDIES PROPOSED,

BY

V. B. BARRINGTON-KENNETT, M.A., LL.M.

VOL. IV.—C.

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CONFERENCE ON MONDAY, OCT. 22, 1883.

J. H. CROSSMAN, Esq., one of the Executive
Committee, in the Chair.

THE CHAIRMAN, in opening the proceedings, said he hoped the result of the meeting would be to call public attention to the absolute necessity of something being done to bring about the purity of our rivers. The subject had been considered very much by Parliament for several years past; two Royal Commissions had sat upon the subject, and three Committees, while six Bills had been introduced, showing that the subject had not been altogether neglected; and the result was the passing of the Rivers Pollution Prevention Act, an admirable Act in its way, but thoroughly futile on account of there being no compulsory power to insist on those who used the rivers for manufacturing purposes keeping the water pure. Mr. Barrington-Kennett, one of the directors of the Manufacturers' and Mill-owners' Mutual Aid Association, who was about to read the Paper, had had frequent opportunities of seeing how badly the rivers were treated in every part of the country. He had much pleasure in introducing him.

RIVER POLLUTION BY REFUSE FROM MANUFACTORIES AND MINES, TO- GETHER WITH SOME REMEDIES PROPOSED.

THE object of this Paper is to bring before the notice of the public the important question of River Pollution by the manufacturing and mining industries, with the view of securing some abatement of a great, and what is still more serious, an increasing national evil.

The subject is one of special importance to all interested in our inland fisheries ; but let me impress upon you the fact, that pollution of rivers is injurious not only to the comfort and well-being of a large mass of our population and to the preservation of fish life, but is also prejudicial to the interests of many manufacturers themselves, owing to the foul condition of the water which has to be used in their industries. Besides there is frequently a waste of valuable materials, which are allowed to run as refuse into the streams.

We must remember that foul water, if only used for power, is often a nuisance ; if polluted beyond a certain degree, it is injurious even to dark and coarse goods in the washing and dyeing processes, and quite unfit for fine fabrics unless first purified by the manufacturer before use.

After a few general remarks, I shall quote the evidence of reliable authorities in order to give some idea of the

magnitude of the evil, and then I propose to group the various industries under separate heads, and in every case—

First, to point out shortly the cause and effect of the pollution ;

Secondly, to refer in general terms to various means suggested for remedying or mitigating the evil.

These remarks will be followed by a short history of the measures and proceedings relating to river pollution, which have occupied so much of the attention of Her Majesty's Government and of both Houses of Parliament from the year 1862 to the present day. This has been compiled by Mr. William Burchell, after a careful examination of numerous Bills, Acts, and Reports of parliamentary proceedings, and other documents on the subject.

The four chief causes of river pollution are clearly set forth by Dr. Edward Frankland in his evidence before the Select Committee of the House of Lords, 1873. They are as follow, viz. :—

First, Solid rubbish of all kinds, causing the silting up of the rivers.

Secondly, Sewage.

Thirdly, Refuse water from manufactories of various kinds.

Fourthly, Mining refuse "which spoils completely for fish and also for human use, and for agricultural purposes many rivers in the mining districts."

The question of sewage, which is a large polluting factor, has been already brought under your notice by the Hon. W. F. B. Massey Mainwaring, Chairman of the Native

Guano Company, and, therefore, my remarks will be mainly confined to the case of pollution from the refuse of our industries.

Those industries are conveniently treated by the Royal Commissioners under various heads; some of these I have grouped, for the purpose of this Paper, in the following order, namely:—

MANUFACTURING INDUSTRIES.

1. Calico-print, dye, and bleach works.
2. Chemical works (alkali, soap, and colour).
3. Tanneries.
4. Paper mills.
5. Woollen works.
6. Silk works.
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Iron and steel wire, tin plate, and galvanising works.

The evidence quoted in this Paper will show that in the opinion of leading authorities, the industries, taken as a whole, would *not* in the long run be losers by the enforcement of more stringent provisions against pollution than exist at the present moment.

In some cases an outlay of capital, for a time no doubt

unprofitable, would be necessary ; but, on the other hand, in many cases it can be clearly demonstrated that such expenditure would prove immediately, or eventually, profitable to the manufacturers themselves. Indeed, many of them so acknowledged in their evidence before the Royal Commissioners. One firm estimated at £3000 a-year and another at £800 a-year the direct money gain to them if the rivers from which they derived their supply of water were rendered clear and colourless.

It will naturally be asked why, under such circumstances, the manufacturers do not voluntarily apply purifying processes ? Amongst others, one reason is that they have not a common or an equal interest.

Take fifty paper-mills on one stream. The first maker at the head of the stream receives his water pure ; he uses and pollutes it, and sends it forward so polluted. He at any rate can have no pecuniary inducement to purify the water he uses, unless he can see a clear profit to be realized from the refuse materials extracted, and saved in the process of purification ; a result which may be too remote, too uncertain, and too small in his estimation for the trouble and risk. His interest in the prevention of pollution therefore may be reckoned as *nil*. The second paper-maker receives the water so polluted—possibly it may be sufficiently pure or will require but little cleansing for his use. Still he has some interest in its purity, and would be prepared perhaps to meet it by some proportionately small outlay. The third will receive the water with twofold pollutions, and his interest in its purification is proportionately greater—and so on through the whole number of mills.

With such diverse, not to say conflicting interests no wonder some controlling power is required. In the

evidence given before the Select Committee of the House of Lords, in 1873, we read, in reference to the industries at Leeds: "Most of those large manufacturers are quite prepared to face the expense and trouble, provided they know what they have to do; but they naturally refuse to go to expense in purifying their waste liquors, unless their neighbours will do something in the same direction."

To show the *practicability* of purifying our rivers, to which I desire to call your special attention, I may refer to the following important passage in the first Report of the Royal Commissioners of 1868, viz. :—

2nd Com.,
1st Rep.,
p. 96.

"Of the many polluting liquids which now poison the rivers of the Mersey and Ribble basins, we feel ourselves justified in stating that there is not one which cannot be either kept out of the streams altogether, or so far purified before admission as to deprive it of its noxious character, and this not only without unduly interfering with manufacturing operations, but even in some instances with a distinct profit to the manufacturer; and even in those cases where a certain amount of expense must be incurred in unremunerative operations, the use of the purified stream will more than recompense this expenditure."

And again, in the fifth Report, dealing with "Pollution arising from Mining Operations and Metal Manufactures," we read :—

2nd Com.,
5th Rep.,
p. 1.

"The remedies for the nuisances which these refuse liquids create have been carefully examined, and, after prolonged inquiry and research, we have been able to report that in every case efficient remedies exist and are available, so that the present use of rivers and running waters for the purpose of carrying off the sewage of towns and populous places, and the refuse arising from industrial processes and manufactures can be prevented without risk to the public health or serious injury to such processes or manufactures."

The action of some authority, independent of merely local interests, is required to bring about the much desired reform.

In discussing a subject touching such important interests it is most desirable that any facts stated, or remedies suggested, should rest on the very highest authority ; and for this reason I have confined myself mainly to the evidence and recommendations contained in the following documents, namely, the Reports of the two Royal Commissions "appointed to enquire into the best means of preventing the pollution of rivers ;" the Report from the Select Committee of the House of Lords "on the Pollution of Rivers Bill," Session 1873 ; Report from the Select Committee of the House of Lords "on Conservancy Boards," printed 1877 ; and the Report to the Local Government Board, 1882, from Dr. Angus Smith, one of the Inspectors under the Rivers Pollution Prevention Act, 1876. From the Reports of the Royal Commissioners so much of this Paper is taken, that I might have called it a digest (very imperfect no doubt) of those most valuable documents which have already led to the Act of 1876, and laid the foundation for further legislation on the subject, so sorely needed at the present moment.

Before calling your attention to the state of the rivers in our centres of industry, it may be well to give the following as a fair history of the pollution of a river in a manufacturing district. I quote it from one of the Reports of the Royal Commissioners :—

"The water issues from the hill-side clear and bright. Even where the sources are taken up for the supply of towns lower down the stream, the 'compensation water,' which is allowed to flow down the original watercourse, comes to the first manufacturer who has works on the stream in a satisfactory condition. He gets for his purposes, whatever they may be, that which the people in the towns are glad to apply to domestic use. But in what state does the water pass away from his works? If it has been used merely as power, it has passed over the mill wheel without receiving any injury ; but if, as is generally

2nd Com.,
1st Rep.,
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unprofitable, would be necessary ; but, on the other hand, in many cases it can be clearly demonstrated that such expenditure would prove immediately, or eventually, profitable to the manufacturers themselves. Indeed, many of them so acknowledged in their evidence before the Royal Commissioners. One firm estimated at £3000 a-year and another at £800 a-year the direct money gain to them if the rivers from which they derived their supply of water were rendered clear and colourless.

It will naturally be asked why, under such circumstances, the manufacturers do not voluntarily apply purifying processes ? Amongst others, one reason is that they have not a common or an equal interest.

Take fifty paper-mills on one stream. The first maker at the head of the stream receives his water pure ; he uses and pollutes it, and sends it forward so polluted. He at any rate can have no pecuniary inducement to purify the water he uses, unless he can see a clear profit to be realized from the refuse materials extracted, and saved in the process of purification ; a result which may be too remote, too uncertain, and too small in his estimation for the trouble and risk. His interest in the prevention of pollution therefore may be reckoned as *nil*. The second paper-maker receives the water so polluted—possibly it may be sufficiently pure or will require but little cleansing for his use. Still he has some interest in its purity, and would be prepared perhaps to meet it by some proportionately small outlay. The third will receive the water with twofold pollutions, and his interest in its purification is proportionately greater—and so on through the whole number of mills.

With such diverse, not to say conflicting interests no wonder some controlling power is required. In the

The Right Hon. Sir Lyon Playfair, M.P., in his evidence before the House of Lords Committee, gives an interesting account of some works near Chorley, where the effluents and liquids from the processes of bleaching, and so on, and dyeing the calico, were mixed together. The acids and alkalies were in such proportions as to nearly neutralise each other; and the effect was that the foul matter in solution was precipitated in the form of a mud. This mud was then treated, and its product gave a considerable profit to the manufacturer. This system is strongly recommended by Sir Lyon Playfair for all works where these processes are combined. It might perhaps be extended to groups of works.

Class 2.—*Chemical, Alkali (Soda & Soap), and Col-
lour Works.*

The pollution of streams by these works is generally due to matters in solution. It would be beyond the province of this Paper to examine at length the different chemical properties and effects of the refuse liquors. For this I would refer you to the 4th and 5th Reports of the Royal Commission, and also to the lately issued Report of the Local Government Board by Dr. Angus Smith.

It is reported by Dr. Angus Smith that 400,000 tons of iron pyrites are annually imported into this country; the alkali trade alone, containing about 1,600 tons of arsenic, a large proportion of which probably finds its way into our rivers and streams.

In alkali works the three chief causes of pollution are, first, the escape of weak muriatic acid, direct from the works; secondly, the drainage from old waste heaps, consisting mainly of a solution of bisulphide and hyposulphate.

of lime ; thirdly, the fresh waste which used to be frequently thrown into the streams.

When the first of these pollutions comes in contact with the second or third foul-smelling gas, sulphuretted hydrogen is evolved.

The case of the "Sankey Brook," at St. Helens, is one in point, and is prominently noticed by the Commissioners as follows :—

"It is no exaggeration to say that this brook renders the country within two miles of its banks uninhabitable, except under a penalty of so much discomfort as few would be prevailed on to endure."

2nd Com.
1st Rep.,
p. 34.

The condition of the brook is described in evidence to be a "positive injury to the property near it. The water is rendered worse than useless for the land, the cattle, and for domestic purposes."

Another witness describes how the polluted water in the Sankey Canal (which is supplied by the Sankey brook) "destroys mortar and metal, and even stone itself." Boat-owners state that for this reason no iron boats are used by traders on the canal. This, no doubt, is an exceptionally bad case ; in fact it is reported as the worst, but we have only to refer to the 1st and 4th Reports to see how serious and widely extended is the evil.

2nd Com.,
1st Rep.
p. 12.

Remedies.—As to the first of these causes of pollutions we learn from Dr. Angus Smith that the St. Helen's manufacturers have decided not to turn any more muriatic acid from their works into the streams, but to utilise it in the manufacture of bleaching powder ; and we hope that this decision will be adhered to, not only in the case of the Sankey Brook, but of other similarly polluted streams. As to the second cause of pollution, namely, drainage from old waste heaps, several processes have been suggested, of

which the latest, that of M. Pechiney, is fully described in Dr. Angus Smith's Report, and can be seen in operation in the Fisheries Exhibition, at the building of the Manufacturers' and Millowners' Mutual Aid Association. The consulting chemist of that Association, Mr. C. G. Cresswell, who has assisted me in some of the technical matters of this Paper, will be happy to give details as to the process. The Mactear's and Mond's processes are also described in detail by Dr. Angus Smith, who remarks—

Rep. 1882,
p. 104. "There can be no doubt that the application of one or other of the modifications of the 'Mactear' process to the waste drainage from the heaps at the great centres of the alkali trade, such as Widnes and St. Helens, would reduce very greatly the nuisance complained of there."

"Were, for instance, a combination of manufacturers along the course of the Sankey Brook to collect the drainage liquors, pump them to a convenient spot (in which my experience of nearly ten years shows there is little difficulty), and treat them with the acid of either one or various works, obtained by arrangement, I am confident the nuisance complained of in that district would be much reduced, and a handsome profit realised by the manufacturers. The result of this method is a drainage without colour, and scarcely scented."

We now come to the third cause of pollution from alkali works, namely, the fresh alkali waste. A process has been recently invented by Messrs. Schaffner and Helbig, and carried out by Messrs. Chance Brothers, of Oldbury, near Birmingham, by which the sulphur and chalk can be entirely recovered from fresh alkali waste. This process is fully described in the same Report of Dr. Angus Smith, but is far too elaborate to be discussed within such limits as I have at my disposal.

2nd Com.,
1st Rep.,
p. 103. With regard to the waste liquors discharged from colour works, which frequently contain arsenic, the Commissioners say that they may be "effectually purified by

= admixture with small proportions of lime and perchloride or
 - sulphate of iron, and subsequent filtration through sand.
 = In this way both the colouring matters and the arsenic are
 - retained upon the filter. As the volume of these liquids
 - is small their treatment cannot inflict any appreciable hard-
 - ship on the manufacturer."

Class 3.—*Tanneries.*

The refuse from the process of tanneries consists, first, of a salt liquid from soaking the skins in water; secondly, a lime liquor, in which the skins are soaked, in order to swell the skin and loosen the hair, which is subsequently scraped off. (This lime liquor does not run direct into the drains or river, it is brought out on the skins on the pavement, and gradually finds its way to these outlets.) And thirdly, the waste tan-liquor from the pits, which may, for all purposes, be regarded as concentrated sewage, possessing from five to ten times its manure value. With regard to this class of pollution, the Commissioners state, that—

"Outside the tanning community itself there can be but one opinion which is, that the refuse matters from a tan-yard are disgusting in a high degree, and should on no account be allowed to pass into rivers." 1st Com.,
3rd Rep.,
p. 36.

They add that they believe the pollution from this source at Leeds—the centre of the tanning industries—is undoubtedly very considerable, and may be prevented without injury to the trade.

Remedies.—Like sewage, these liquors can be treated by irrigation, intermittent filtration, or precipitation by chemicals. I understand that Mr. Baldwin Latham, C.E. has carried out automatic arrangements for mixing chemicals with the refuse liquors before they pass into the pre-

precipitating tanks ; and I am informed by Mr. Hanson that his automatic machine and system can be conveniently applied to these and similar polluting liquids.

The difficulty of obtaining available space in the case of large towns has been brought forward as a serious objection against the remedies proposed. Mr. W. Crookes, F.R.S., in his evidence before the Select Committee of the House of Lords, 1873, suggests that where the works are done together, as in the case of Leeds, there would be no difficulty if all the owners of tanneries and dye works in one neighbourhood were to join together and construct a drain, so as to carry the polluting liquids to some little distance, and purify them jointly. He quotes a case showing that the polluting effluents from these two industries—tanneries and dye-works—when mixed together, mutually precipitate each other, and states that by assisting that precipitation by well-known chemical means, the liquid that would flow from it would be almost pure enough to fulfil the requirements of the Bill then before the House of Lords Committee.

Class 4.—*Paper Mills.*

The chief causes of pollution are first the foul water produced by washing rags and other material ; secondly, the caustic soda liquor in which the rags, or esparto grass, as the case may be, have been boiled. This occasions the scum observed on the surface of the water. Thirdly, the discharge of bleaching liquor containing chloride of lime.

Remedies.—The first pollution can be purified by intermittent filtration, or by chemical treatment combined with mechanical filtration. The second (caustic soda liquor) can be evaporated to dryness, and the residue ignited in furnaces, when the soda ash will be recovered. The third

(the discharge of the bleaching liquor) does not occur in well-regulated mills. It is described by the Commissioners to be "a slovenly waste of valuable material, and its prohibition could, therefore, entail no hardship upon the manufacturer." Among minor pollutions, water charged with paper pulp also finds its way into streams; but if passed through a filter press it is not only purified, but the residue is of great value as a paper-base.

To show the practicability of profitably recovering the soda ash by the means indicated above, I might mention that one of the largest paper manufacturers in England, Messrs. C. and J. Potter, of Darwen, near Blackburn, recover their soda ash by a mechanical evaporator erected by Messrs. Fawcett, Preston & Co. The result is that the effluent fluid is purified, and the value of the soda ash recovered amply repays the cost of the plant.

Class 5.—*Woollen Works.*

The chief causes of pollution are, first, the scouring; secondly, the dyeing; thirdly, the fulling; and fourthly the printing operations.

Wool is first immersed in a copper filled with a solution of a caustic nature, diluted with water and heated by steam, and is afterwards washed in cold water. The Commissioners remark that :

"The discharge into rivers of large quantities of water in which dirty wool has been steeped would be bad enough even if water alone were used, but the nature of the filthy liquid which is actually employed makes it thoroughly disgusting. The first portions of the washings are a yellowish, glutinous, stinking liquid, and this, as we have said, is passed into the rivers."

1st Com.,
3rd Rep.,
p. 22.

Then comes the dyeing process; the discharge of the waste liquid from the dye vats occasions the black



appearance of the rivers in the woollen manufacturing districts. The third report states :

1st Com.,
3rd Rep.,
p. 24.

"Its discharge in enormous quantities helps to silt up the stream and the mill goits. If it could be kept out of the streams, they would be *comparatively clean*."

In the fulling and washing process the cloth is passed through rollers, and immersed repeatedly in a strong solution of soap; this is called "fulling." It is then washed in water until all the soapy liquid is removed. The refuse liquids produced are called "soap waters," or "soap suds," which, when allowed to flow into rivers, have a very polluting effect.

This leaves us only the fourth cause, the printing, to explain. The various colours used are generally thickened with flour paste. The whole of this, with the greater portion of the colouring matter and water remaining in the vats after the goods are removed, is allowed to run into the stream, and constitutes a black or coloured foul liquid.

Remedies.—The waste liquor from the scouring and dyeing processes are by far the most polluting. If mixed with sewage they could be profitably used for irrigation. Where this is not practicable they can be purified by intermittent filtration. This can be greatly facilitated by a preliminary process of chemical precipitation. In other cases a mechanical method of filtration is suggested by the Royal Commissioners, who made special mention of the Needham press in reference to this process.

1st Com.,
3rd Rep.,
p. 25.

As the result of some trials of filtration by a press at Huddersfield, the Commissioners say :

"These trials were very satisfactory to us, as showing that it is perfectly practicable to separate from the dye-waste the most objectionable portion, and to discharge into the river a liquid comparatively pure."

The soap-suds produced in the fulling operation, can be freed from the polluting grease by well-known and simple processes. It is said that £100,000 worth of grease is actually recovered, and an equal amount is further recoverable in Yorkshire alone. The Commissioners, however, in their third report, state that grease extraction, as then generally practised, was unsatisfactory in the extreme, and make some valuable suggestions, remarking that

“The entire question of dealing with the soap waste must be met on the part of manufacturers in an earnest and intelligent spirit, and we do not doubt that, with the appliances which science offers, and of which the millowners of Yorkshire have shown themselves well able to take advantage of in other respects, so large an economy may be secured that abundant funds will be forthcoming to deal with the other causes of pollution, such as dye and scour water, till such time as these in their turn become, as they surely will, a source of profit instead of a *nuisance* and a *disgrace*.”

1st Com.,
3rd Rep.,
p. 35.

The refuse from the printing processes has been already referred to in my remarks under Class 1, Calico, &c., works. The washing waters of the dyed goods can be admitted into streams, provided that the excess of dye has been first squeezed out of the cloth by rollers. Should this not be done, these and other drainage liquors from woollen factories can be utilised for irrigation.

As an adjunct to other modes of purification, the system of evaporation has been strongly recommended, in which the waste heat of furnaces can be utilised, or the liquid can be run into the ash-pits. In this case, as in filtration, care must be taken to separate the most filthy liquids from those greatly diluted.

Class 6.—*Silk Works.*

Pollution is caused, first, from the soap-suds, produced by boiling the raw silk in a solution of soap to remove the



natural gum: and, secondly, from the discharge of the refuse water from the dye vats. The treatment suggested for the soap-suds has been mentioned above, and the discharge from the dye vats can be treated in a similar manner as in the case of the woollen industry.

Class 7.—Linen and Jute Works.

The chief causes of pollution are, first, the flax steeping, secondly, the bleaching process, and thirdly the dyeing. The raw flax is steeped in pits of water to cause the putrefaction of the stem, and the water is afterwards allowed to run into the streams. It is estimated that in the basin of the river Forth 2,750,000 gallons of polluted water thus enter the streams annually. Some of the streams running into the Avon and Almond are described to have been completely spoiled for several weeks every year from this cause.

Linen and jute bleaching constitute, the Commissioners say, "one of the most formidable sources of water nuisance." In bleaching flax there are twenty-six operations, and the waste liquors from all these are generally discharged into the streams.

Remedies.—Irrigation or filtration. The most filthy liquids being separated from the general drainage of the factory. In some cases the saving of waste refuse will repay the cost of evaporation.

As to the jute dyeing the Commissioners remark that

2nd Com.,
4th Rep.,
p. 38.

"The general drainage from jute and dye works is highly polluting. It is, however of such a character that it could be mixed with town sewage without detriment to the employment of the latter for irrigation or for purification by intermittent filtration."

Again they say that the remedy "is simple as it is certain that this liquid is a manure of considerable agri-

cultural value, and it ought to be utilized on the neighbouring lands."

Class 8.—*Starch Works.*

There are two distinct processes, one fermentive, and the other chemical, for separating gluten from the starch granules contained in rice and other cereals. In the former process the gluten is extracted by putrefactive fermentation, producing an intensely polluting liquid which finds its way into the streams. In the other process the gluten is extracted by a caustic alkali, giving a solution from which the gluten can be precipitated and utilised. In this latter case there is no pollution.

A remedy in the fermentive process is to utilise the waste liquor on the land by a system of irrigation, as it is equal to town sewage in manurial value.

In reference to this industry the Commissioners remark that—

"In all well regulated starch works much of the glutinous and polluting matter is extracted and profitably utilized, leaving but comparatively little to be dealt with by the purifying processes proper. Our inspection of starch factories, and our knowledge of the operations involved in the starch manufacture, enable us to state that the pollution of streams by starch works is unnecessary, and can be altogether avoided without any serious injury to the manufacturer."

2nd Com.,
4th Rep.,
p. 70.

Class 9.—*Alcohol Distilleries.*

Pollution from these works is chiefly caused by the waste liquor called "wash" or "pot-ale," from which the alcohol has been removed by evaporation. The Commissioners in the Fourth Report consider—

"That the complaints in Scotland of the great damage done to streams when the liquor is allowed to run into them, are fully confirmed."

They say, in reference to the Sancil Distillery,

2nd Com., "Pot ale has about thirty-six times the polluting power of average
4th Rep., London sewage, but as its manure value is also equally high, the
p. 42. prohibition to cast it into running water would prevent a scandalous
waste, whilst it hindered the utter spoiling of the stream by polluting
liquid, containing such an enormous quantity of organic matter which
is peculiarly prone to enter into rapid and disgusting putrefaction."

And the Commissioners append the following evidence
of the distillers at the Great Cameron Bridge Distillery,
Markinch, Fife :—

"We are considering, in order to avoid pollution in future, the most
effective means of keeping our dreg or pot ale out of the rivers, but
have not come to any decision yet. We are, however, prepared to
send all refuse from our works in a pure state if we get the water
pure."

Further on in their Report they add, in reference to an
instance in which purification of distiller's drainage had
been carried out, that though it was not quite successful, it
was "yet sufficiently so to demonstrate the practicability
2nd Com., of cleansing this foul liquid by employing it for the irriga-
4th Rep., tion of crops." Another remedy is filtration under pressure,
p. 68. whereby the matters in suspension are retained, and are
valuable for feeding cattle.

Class 10.—*Paraffin, Petroleum, and Tar Works.*

2nd Com., The Commissioners report that pollution from these
4th Rep., works is, in some parts of Scotland, "a serious and in-
p. 42. creasing evil." They consider that the refuse liquids,
which are exceedingly foul, cannot be purified by any
2nd Com., practicable means, and add that "total exclusion from
4th Rep., running water is the only remedy for this form of river
p. 69. pollution."

This is remarkable, and worthy of all attention ; it is the

only instance, it is believed, in the diligent researches and voluminous reports of the two Comissions, in which this admission is to be found. It is the exception which proves the rule. The Commissioners, however, shortly afterwards qualify their assertion, by adding : "Fortunately the volume of the polluting liquids is not large, and a portion of them admits of conversion into a profit, in others at an insignificant loss."

2nd Com.,
4th Rep.,
p. 69.

They conclude with the consolatory remark, that "an absolute prohibition of all drainage from paraffin and petroleum works into streams would, in our opinion, inflict no serious loss upon these branches of manufacture."

2nd Com.,
4th Rep.,
p. 70.

I should here desire to call your special attention to the very interesting evidence given in 1873 by Sir Lyon Playfair, M.P., before the Select Committee of the House of Lords on the River Pollution Bill, p. 11.

"I must confess," he says, "to your Lordships, that I myself am a great polluter of streams. I have an interest, as a director, in the largest paraffin works in the kingdom, and I am a polluter of streams under that 10th clause." [One of the clauses in the Bill then under consideration.] "I think that if you force us to purify the water which we discharge fouled in this way, before long we shall find efficient modes of doing it. At the present moment we have not efficient modes of doing it, and yet, as one of the largest polluters of water in the kingdom from this very thing, I advocate that you should make me purify the water before I discharge it."

Their Lordships adopted his disinterested advice, and passed the Bill with that 10th clause, but unfortunately the Bill was sent to the Commons very late in the session, and was dropped.

Remedy.—Although the refuse liquids cannot be purified so as to admit of their being discharged into streams, yet there is a method of disposing of them on the works themselves. Their volume being not large, they can be thrown

P. 17. into the ashpits of the furnaces, where they will be evaporated by the waste heat. This is the course recommended by Dr. E. Frankland in 1873, in his evidence before the same Select Committee of the Lords.

Class 11.—*Sugar Refineries.*

The cause of pollution here is in the process of filtration of the crude sugar after it is dissolved in lime-water. A large quantity of refuse matter remains behind in the filter-bags, which is removed by washing the bags in water. The waste liquor, when allowed to run into streams, is exceedingly polluting, and estimated as "one hundred times more potent than its own volume of town sewage in rendering running waters foul and useless."

It is considered that a single large sugar refinery must ruin any ordinary stream if this refuse is allowed to run into it.

2nd Com.,
4th Rep.,
p. 44.

The remedy for this evil suggested in the Fourth Report is, in towns to discharge the refuse into the sewers, to be purified with the sewage—a remedy, however, which is fraught with some difficulties; in other cases a system of evaporation has been recommended and has, I believe, been carried out successfully.

MINING INDUSTRIES.

There is a great distinction between the refuse water from these industries, and those treated in the former part of this paper, owing to the fact that pollution from mines is entirely inorganic, and nearly always arises from matters in suspension.

The chief causes of pollution are, first, the shooting of solid waste refuse into the watercourses; secondly, the

discharge of water which has been used on the dressing-floors to separate the rocky matter, or "gangue," from the metallic portion of the ore after crushing. This water, though it generally passes through several catch-pits carries with it in suspension a certain quantity of finely-divided metallic matter of a highly poisonous nature. Thirdly, the discharge of polluted water from the underground workings into neighbouring streams by adits or by pumps.

Class 1.—Collieries and Coal-washing.

The Commissioners remark "that the water discharged from coal-mines where iron pyrites abound, is much polluted by sulphate of iron, and is highly injurious to fish."

2nd Com.,
5th Rep.,
p. 4.

Class 2.—Iron, Lead, Copper-mines, &c.

The Commissioners report that "Of all forms of mining industry carried on in this country lead-mining is the one which causes the most serious pollution of our rivers." They particularly refer to the streams near Aberystwith, as the "most marked examples of the injuries which they sometimes both suffer and inflict," and they record the complaints which they heard from "both fishermen and riparian owners."

2nd Com.,
5th Rep.,
p. 10.

id. p. 15.

In speaking of the composition of water from copper-mines, the Commissioners say :—

"It is a startling reflection that even at the lower rate of sale (at the Great Devon Consols) there leaves this single mine every month an amount of white arsenic competent to destroy the lives of more than 500,000,000 of human beings. We saw stored in its warehouses, ready packed for sale, a quantity of white arsenic probably sufficient to destroy every living animal on the face of the earth. It is, perhaps, still more startling to reflect that there is no efficient law to prevent

2nd Com.,
5th Rep.,
p. 17.

manyfold of this deadly material being cast monthly into the rivers and watercourses of this country ; not, it is true, to expend its poisonous energy at once, for the mundic is insoluble in water, but by its slow decomposition to render rivers so treated poisonous and uninhabitable by fish for many generations."

Class 3.—*Tin, Baryta, &c.*

2nd Com.,
5th Rep.,
p. 19.

The effluent water from tin-mines is considered to be injurious to fisheries, besides silting up the river. In the case of the Dolcoath mine it is estimated that every million gallons of effluent water carries with it over 80 tons of suspended rubbish, in which there is an equivalent to 264 lbs. of white arsenic.

Remedies for Classes 1, 2, and 3.—The only practicable remedy for the pollution caused by mine waters is considered by the Commissioners to be that of subsidence. Unfortunately this process involves a considerable length of time and consequent expense to make its success complete ; but a moderate amount of subsidence, say, of six hours, would reduce many of the evils. They refer particularly to the relief it would afford against the silting up of our rivers, and the destruction of fish ova by the deposition of mud upon the spawning-beds, and conclude their remarks by stating that they are—

2nd Com.,
5th Rep.,
p. 44.

"Not without hope that a considerable profit would in many cases accrue to the proprietors of mines from the retention, within their own premises, of the metalliferous mud which they now recklessly or carelessly allow to escape them, to the destruction of fish, the poisoning of cattle and poultry, and the transformation of fertile land into sterile desert."

Methods have been suggested by which the supernatant water from the subsidence pits, instead of being allowed to run into the streams, is pumped back and used again in the works in place of fresh water. A model of an invention

of Dr. Harries, of Aberystwith, to effect this is shown in this Exhibition in the building of the Manufacturers' and Millowners' Mutual Aid Association.

Class 4.—*China Clay Works.*

Pollution from this source is due to the discharge of a small quantity of fine china clay and mica, which escapes subsidence in the settling pits, used in the manufacture. It renders all rivers into which it flows perfectly white, and, while not perhaps a pollution in the accepted sense of the term, is undoubtedly noxious to animal and fish life. It also tends to form banks of a highly putrescible character by catching and dragging down any foul organic matter that may be floating about.

The remedy is an improved method of manufacture, whereby filter presses are used in combination with settling pits, and a pure effluent flows into the river.

METAL INDUSTRIES.

The pollution by refuse-liquors from iron and steel wire, tin-plate, and galvanizing works is considered to be the "most intense, noxious, and notorious."

2nd Com.,
5th Rep.,
p. 32.

The chief cause of pollution is the steeping or "pickling" of the iron in dilute sulphuric or muriatic acid, producing sulphate or chloride of iron respectively; the former is most commonly used. A large proportion of free acid is always left after this operation, and is allowed to run into the sewers or streams.

In the evidence given in the case of some Caerleon tin-plate works it is stated that the water is so seriously affected by the discharge into it of these acid liquids that

it actually corrodes the insides of boilers, causing constant risk of explosion.

The Commissioners state, after a careful analysis of samples of the refuse water :—

2nd Com.,
5th Rep.,
p. 35.

"These numbers prove in the most unmistakable manner the highly polluting and strongly acid character of most of these discharges; and their noxious properties are in many cases greatly intensified by the reckless manner in which they are suddenly discharged in large volume into sewers and streams, dissolving the cement and thus loosening the brickwork of the former, and destroying the fish in, and otherwise rendering useless, the latter. There is no necessity whatever for thus getting rid of these waste liquors, and the interdiction of their escape from the factories would be no hardship to the manufacturer, but would, in most cases, yield him a considerable profit."

Remedies.—First, where sulphuric acid has been used "for pickling," the waste liquor may be evaporated until crystals of green vitriol, which have a marketable value, separate out; the mother liquor is then fortified with fresh sulphuric acid and used again, no liquor being allowed to enter the streams. Secondly, where muriatic acid has been used two remedies are suggested: the liquor may be concentrated by evaporation, when the residue has some value as a disinfectant, or the acid may be neutralised by lime or chalk, which throws down the iron and leaves a non-polluting liquid.

Report to
Local Gov.
Board,
1882,
p. 87.

Dr. Angus Smith, in laying down rules as to works in South Wales, states that it is expected these waste liquors shall be so treated that none of the acid solutions shall be allowed to flow into the streams. He also suggests methods whereby the water in which the plates, &c., are washed after "pickling" shall be rendered innocuous. In a former portion of this Paper I have quoted the Commissioners to show that remedies for this class of pollution are considered to be perfectly practicable and remunerative.

This concludes the list of the various industries about which I proposed to treat. I have quoted freely from the Reports of the two Royal Commissions, whose six years of investigation was followed, in 1876, by the Rivers Pollution Prevention Act, now in force. This Act, however, whilst it recognised the expediency of making further provision for the prevention of the pollution of rivers, and in particular to prevent the establishment of new sources of pollution, did little towards the enforcement of the law. It, in effect, made that which was clearly an offence against the common law an offence against the Act, but it did practically nothing to facilitate the enforcement of the principle upon which that Act was based.

The Act contains no "standards of purity" for effluent waters, as framed by the Commissioners after years of labour and investigation, and strongly recommended by them for the information of the polluters and the sufferers, and for the guidance of the administrators of the law; no "adequate penalties" to enforce the "prohibition of the gross pollution;" no inspectors to whom should "be committed the duty of detecting and proving offences against the law, and of procuring the conviction of offenders;" no "formation of river conservancy boards with limited authority for taxation and expenditure;" and, moreover, proceedings to enforce the law "as to manufacturing and mining pollutions" were actually hampered and rendered more difficult by the restrictive provisions of the Act.

In reference to this Act, I cannot do better than quote the following passage from a Paper on "River Pollution," read by Professor H. Robinson, C.E., last month at the Glasgow Congress of the Sanitary Institute of Great Britain :—

"When the Rivers Pollution Prevention Act was passed in 1876 hopes were entertained that it would result in stopping the pollution of our rivers. If, however, the working of the Act up to the present time is considered, it must be admitted that it is practically inoperative, and the results that have accrued are utterly incommensurate with the evils that had to be grappled with."

The following are the standards of purity mentioned above, below which no drainage water should be dischargeable into river channels. They are recommended by the Commissioners in their fifth and last Report, and represent the result of six years' incessant investigation of the chief manufacturing processes carried on in the country. The Commissioners recommend that colliery water and mine waters should be exempted from the operations of Standards *d* and *e*, remarking that the polluting substances in these cases "are not as a rule in the cases exempted the result of waste products of a manufacturing operation," but are "the result of the natural washing, for the most part unavoidable, of natural mineral substances."

2nd Com.,
5th Rep.,
p. 49.

"(a.) Any liquid which has not been subjected to perfect rest in subsidence ponds of sufficient size for a period of at least six hours, *or* which, having been so subjected to subsidence, contains *in suspension* more than one part by weight of dry organic matter in 100,000 parts by weight of the liquid, *or* which, not having been so subjected to subsidence, contains in suspension more than three parts by weight of dry mineral matter, or one part by weight of dry organic matter, in 100,000 parts by weight of the liquid.

"(b.) Any liquid containing *in solution* more than two parts by weight of organic carbon, or 0.3 part by weight of organic nitrogen in 100,000 parts by weight.

"(c.) Any liquid which shall exhibit by daylight a distinct colour when a stratum of one inch deep is placed in a white porcelain or earthenware vessel.

"(d.) Any liquid which contains *in solution* in 100,000 parts

by weight, more than two parts by weight of any metal except calcium, magnesium, potassium, and sodium.

"(e.) Any liquid which, in 100,000 parts by weight, contains, *whether in solution* or suspension, in chemical combination or otherwise, more than 0.05 part by weight of metallic arsenic.

"(f.) Any liquid which after acidification with sulphuric acid contains, in 100,000 parts by weight, more than one part by weight of free chlorine.

"(g.) Any liquid which contains, in 100,000 parts by weight, more than one part by weight of sulphur, in the condition either of sulphuretted hydrogen or of a soluble sulphuret.

"(h.) Any liquid possessing an acidity greater than that which is produced by adding two parts by weight of real muriatic acid to 1000 parts by weight of distilled water.

"(i.) Any liquid possessing an alkalinity greater than that produced by adding one part by weight of dry caustic soda to 1000 parts by weight of distilled water.

"(k.) Any liquid exhibiting a film of petroleum or hydro-carbon oil upon its surface, or containing in suspension, in 100,000 parts, more than 0.05 part of such oil."

The Commissioners had recommended these standards two years previously, but modified some of the definitions of offence in the case of the mining and metal industries. In reference to the standards first proposed by them, and thus severer in the case of these two industries than those which I have quoted, they say :—

"These standards have been framed with the most careful regard for the interest of both towns and manufacturers. Methods have been described in our reports, involving no excessive expenditure, by which the strongest town sewage and the foulest liquid waste from manufactories can be adequately cleansed, so that these standards shall not be offended by the effluent water. We believe that the adoption of none of them will inflict any injury at all upon manufacturers; indeed, we have every reason to conclude that the adoption of these standards will save the manufacturers of this country from inflicting considerable injury upon themselves, whilst, by preserving the whole course of

2nd Com.,
4th Rep.,
p. 104.

rivers in a comparatively clean and usable condition, they will tend powerfully to the extension of manufactures upon the banks. One of the most crying evils in manufacturing districts is the want of clean water, and, therefore, every successful effort to make dirty water again usable is a direct gain to manufacturers.

"On the assumption, therefore, that the discharge of strongly polluting water is to be forbidden by legislative enactment, we consider these standards of pollution as real friends to manufacturers, telling them in clear, intelligible, and definite terms what it is which they have to avoid, and shielding them, as the Alkali Act has so notoriously shielded the alkali manufacturer, from vexatious litigation.

"In this opinion we are glad to be confirmed by the testimony of European chemists of the highest reputation. In the second volume of this Report (Part IV.), statements will be found from Baron von Liebig, President of the Academy of Sciences, Munich; M. Dumas, Perpetual Secretary of the French Institute, and Dr. Hoffman, Professor of Chemistry, Berlin, which entirely bear out all that we have said of the desirableness and practical character of the standards we have proposed, and their entire consistency with the true interests of manufacturers and corporations."

This brings me to Mr. Burchell's condensed chronological history of the administrative proceedings during the last twenty years in reference to River Pollution.

1862.—Prior to the year 1862, the alkali works had, as then carried on, been found to be productive of such serious evils, both to the air and the waters in their neighbourhoods, as to induce the House of Lords in that year to appoint a Select Committee to consider and report thereon.

1863.—This was followed by the Alkali Act of 1863. It dealt with the more urgent of the two evils resulting from those works—the vitiation of the air, and *not* the impurification of the waters.

It was, however, a good commencement, and in the right direction; it prescribed a standard for the condensation of the gas emanating from the alkali manufactures.

and provided for the appointment of inspectors by the Board of Trade, to enforce the observance of that standard, and doubtless led to the Bill of the following year.

1864.—That Bill, under the title of the “Rivers Pollution (Scotland) Bill,” was “to prevent the discharge of impure water from manufactures into rivers in Scotland,” and was introduced by the Lord Advocate, Sir George Grey, then Home Secretary, and Sir William Dunbar. Its provisions were very stringent against, and well adapted to prevent, pollution of rivers from industrial works; but they applied only to such as were “erected or established after the passing of the Act.” It did not, however, pass the Commons; probably it was considered better that the whole question of river pollution should be dealt with in some general measure.

1865.—In the next year a Bill, which curiously enough related only to England, under the title of the “River Waters Protection,” was introduced into the Commons by Lord Robert Montagu, Sir Fitzroy Kelly, Mr. Ferrand, and Mr. Hibbert, “to amend and better to administer the laws for the protection of waters in rivers and streams in England.” It comprised no less than 161 Sections, providing for the constitution of “Protection Boards,” with ample powers, “after the 1st of January, 1870” (more than four clear years), “to prevent any foul overflow from a manufactory or place used for trade, or wherein dyeing, brewing, distilling, manufacturing, or chemical process is used or carried on, to pass into a river or stream;” but, like the Scotch Bill, it did not pass the Commons. Its introduction, however, apparently had its effect, as later in the same year Her Majesty was advised to issue the first Commission, to which reference has been made, to inquire into the best means of “preventing the pollution of rivers.”

The Commissioners appointed were R. Rawlinson, Esq., C.B. (now Chief Engineering Inspector of the Local Government Board), Sir William Thomas Denison, and John Chalmers Morton, Esq.

1866.—This naturally led to a lull in Parliamentary proceedings; but "Rivers Pollution" was kept steadily before the notice of Parliament, the Government, and the public.

During the year, the Royal Commissioners personally inspected rivers and industrial works, and investigated the causes, the effect, and the remedies of and for river pollution. They also submitted their first report relating to the "River Thames," which was "presented to both Houses" and printed.

1867.—This was followed by another report from the Commissioners, relating to the rivers Aire and Calder, which in like manner was "presented to both Houses" and printed.

1868.—Her Majesty issued the second Commission, consisting of Sir William Thomas Denison, Edward Frankland, Esq., and John Chalmers Morton, Esq.

1869.—The new Commissioners, as appears from their reports, personally inspected many polluted streams and polluting works, and considered much verbal and written evidence touching the causes, effects, and remedies of and for river pollution.

1870.—The Commissioners presented two reports, one "on the ABC process of treating sewage," and the other "relating to the Mersey and Ribble Basins."

1871.—The Commissioners continued their investigations, and presented their third report, "relating to pollution arising from the woollen manufacture and processes connected therewith;" and in

1872.—They issued their fourth report relating to the "Rivers of Scotland."

1873.—This was followed by a Bill introduced by the Earl of Shrewsbury "to amend the laws relating to the pollution of rivers." It averred "*that the pollution of rivers had of late so increased as to become a national evil.*" It was evidently based upon the reports of the Commissioners, and adopted, *inter alia*, their recommendation of standards of purity for various liquids before they should be permitted to enter the streams. It was referred to a strong Select Committee of the House of Lords. The Committee heard the objections of the representatives of the leading industries to the Bill, and also witnesses in support. The evidence is interesting, and shows conclusively the strength of the case against pollution and the expediency of stringent measures for its suppression. The Select Committee reported in favour of the Bill, and the House passed it; and sent it to the Commons on the 21st of July, where, probably from the lateness of the session, it was withdrawn.

1874.—The Commissioners made their fifth report relating to pollution arising from mining "operations and metal manufactures." This was the year of the new Parliament, and it passed, amidst press of other matters, without any Bill in either House relating to the purification of rivers.

1875.—A Bill was this year introduced in the Lords, "for the better prevention of the pollution of rivers." It provided for the constitution of a "Conservancy authority," and contained some stringent provisions for the prevention of river pollution. It passed their Lordships' House, and was sent to the Commons, where it was read a first and second time; but never got as far as Committee.

1876.—Two Bills were introduced, one in the House of Lords, intituled "Clean Rivers Bill," "for making further provision against the pollution of rivers hitherto free from pollution."

It passed the Lords, and was sent to the Commons, and there it was stopped.

The other in the House of Commons, under the title of the "Pollution of Rivers," "for making further provision for the Prevention of the Pollution of Rivers." It passed both Houses, and became "The Rivers Prevention Pollution Act, 1876." This is the Act now in force.

As mentioned above, it contains no provisions, as recommended by the Commissioners, for the constitution of conservancy or protection boards, or for standards of purity, or for the appointment of local inspectors; *in short, no adequate machinery for the enforcement of its own prohibitions.*

1877.—Parliament was evidently not satisfied with the legislation of the preceding year, and accordingly a Select Committee of the House of Lords was appointed "to consider by what means Conservancy Boards could be more conveniently and inexpensively constituted." The Committee were urged by several witnesses to enforce the provisions of the Act of the previous year. One experienced witness, the general manager and engineer of the trustees of the Aire and Calder Navigation, referred to a case where the trustees had been unable to induce the Town Council of Leeds to prohibit the pollution of a tributary of the Aire, as an instance to show "how difficult it was to get local bodies of corporations, who are the creators of the nuisances, to put in force any power provided for their remedy." Their Lordships were told in so many words, that it is the general im-

pression that it [the Act of last year] "will be inoperative." It is a great warning to parties polluting rivers, and also to "those casting in refuse, but the difficulty is to put it into action." Their Lordships in their report appear to have adopted that conclusion, as they were "of opinion the conservancy boards" which they had recommended, "should be enabled to execute the powers for the prevention of the pollution of rivers conferred on local authorities by the Rivers Pollution Prevention Act," and, accordingly, in

An. : Qn.
1736.

An. : Qn.
1731.

Rep. p. 5.

1879.—A "Rivers Conservancy Bill" was introduced in the Lords to make provision for the conservancy of rivers. It proposed to establish Conservancy Boards, with duties "for the conservancy of rivers and watercourses, and the mitigation of floods within their districts." It passed the Lords and was sent to the Commons, where it was read a first and second time, and committed. Notice of various amendments for Committee were given, and one of them, following the recommendation of the Lords Special Committee, empowered the Conservancy Boards "to take proceedings to enforce the provisions of the Rivers Pollution Prevention Act, 1876," but the Bill never reached Committee, and on the 15th of July was, with four other Bills for home improvements, county boards, &c., sacrificed to the urgency of other public business.

1881.—Both Houses of Parliament appeared anxious to redeem the lost session of the preceding year, and each addressed itself early and energetically to river pollution. In the Commons, on the very first possible day, five members, not the customary two, introduced a Bill under the title of the "Rivers Floods Prevention," "to make provision for the better prevention of floods, and for the conservancy of rivers." It proposed to constitute General

Conservancy Boards, District Conservancy Boards, and Sub-district Boards, and it empowered General Conservancy Boards to enforce the provisions of the River Pollution Prevention Act of 1876. It was read the first time on the 7th of January, and a second time on the 20th of January, and was ordered for Committee.

The Lords were equally prompt. They introduced a Bill, on the first available day in their House, under the title of the "Rivers Conservancy and Floods Prevention Bill," passed it through all its stages, and sent it to the Commons on the 18th of March.

The introduction simultaneously of two Bills in the respective Houses, avowedly for effecting the same purpose, was not a little unusual. The proceedings on them were still more remarkable.

Be it remembered that the principle of those Bills and their respective provisions had been more or less suggested, discussed, considered, and recommended by two sets of Royal Commissioners, by three Select Committees of the House of Lords, and in the various proceedings on the six Bills which had been introduced in six preceding years.

Thus, then, on that 18th of March the Commons had before them their own "Rivers Floods Prevention Bill," which had been read a second time, and the Lords "Rivers Conservancy and Floods Prevention Bill," which they had just received. On the 19th of March they read the Lords' Bill a first time, and, after two divisions on motions adverse to the Bill, which were respectively defeated by 118 to 51, and 118 to 42, a second time on the 8th of April.

Both Bills were then committed, *not*, as usual with public Bills, to a Committee of the whole House, but to a Select Committee.

Thus the two Bills, one which had passed all stages in

the Lords, and the other, which had been read a second time in the Commons, were referred to the same Committee.

This, at this early period of the session, looked very like business, or legislation. But it was not to be ; by reason of many adjournments, and various discussions as to the number of which the Committee should consist, ultimately determined at twenty-one, it was not nominated till the 10th of June, a loss of more than two months. The Committee included three members of the Government, Mr. Dodson, Lord E. Cavendish, and Lord F. Fitzmaurice.

The Committee met under the chairmanship of Mr. Dodson, and after seven days sitting, reported on the 29th of June, in favour of the Lords Bill, as amended.

The amended Lords' Bill, instead of being thereupon, as was to have been expected, according to the usual practice of the House, read a third time and passed, was re-committed to a committee of the whole House. Still, as it was only the commencement of July, there was yet apparently ample time to pass a bill which had gone through the Lords, and had also been so fully discussed by a strong Select Committee of the Commons.

Not so, however ; the meeting of the Committee of the House was deferred by numerous short adjournments to the 2nd of August, when the Order for Committee was discharged, and the Bill shared the fate of its many predecessors, and was withdrawn ; and once more the session terminated, so far as respected that trifling matter, the "national evil" of river pollution, *re infecta*.

Why the Lords' Bill, as amended by the Select Committee of the Commons, was not passed it is difficult to imagine, unless the honourable member, Mr. Dodson, thought that the Act, without the provision which he had inserted in his own Bill, giving the Conservancy authorities

powers to enforce the provisions of the Rivers Pollution Prevention Act of 1876, would be of little or no value, and that it would be better to leave the whole matter open for a future session.

The session of this year was not, however, quite barren as respected rivers pollution, inasmuch as in anticipation of the passing of some measure for the enforcement of the Rivers Pollution Prevention Act, and that the industries might thereby be placed in a temporary difficulty, Parliament passed the Act incorporating the Manufacturers' and Millowners' Mutual Aid Association. It conferred on that corporation powers similar to those granted under the Improvement of Lands Act, 1864, for raising moneys which might be required by the industries for the construction of works for the purification of the drainage of their premises, and securing the repayment by a system of statutory charges on the freehold of the premises.

1882.—Immediately on the re-assembling of Parliament in the next year, Mr. Dodson, in conjunction with Mr. Hibbert, introduced a Bill into the House of Commons under the same comprehensive title as the Lords' Bill of last year, namely, the "River Conservancy and Floods Prevention Bill."

The Bill, as was to be expected, was substantially the same as the Lords' Bill of the preceding session, but it did not, as was perhaps also to have been expected, contain the all-important clause which had been inserted in the Commons Bill of the previous year, empowering the Conservancy Boards to enforce the provisions of the Act of 1876.

The Bill was read the first time on the 10th of February, and the second time on the 21st of February, after a division, 147 for and 18 against, and committed. Not-

withstanding this strong division in its favour, and that it was essentially the same as the Bill passed by the Lords in the preceding year, the Committee was from time to time deferred until the 7th of July, when, like its many precursors, it was withdrawn with other Bills of the session.

1883.—Undeterred by this ignominious termination, Messrs. Dodson and Hibbert, strengthened by the addition of Sir Charles Dilke, introduced early in the session a Bill under the same title, and, saving a few verbal alterations, with identically the same provisions as their Bill of last year, and with a like result. And so the curtain once more drops upon these apparently endless efforts at effective legislation.

Is it unreasonable to express a hope that the next session will not be allowed to terminate without effective legislation? Why should an all-pervading public nuisance be longer tolerated? It is not a case of no cure and therefore of endurance. There is a cure for most, and a palliative, at least, for all that will remain of this "national evil."

DISCUSSION.

Colonel LEACH said the question which Mr. Barrington Kennett had brought forward was one of universal interest. There could be no doubt whatever that many of our rivers were polluted so as to be noxious in the highest degree; there could be no doubt that it was extremely desirable that this pollution should be stopped. He did not think there could be any doubt whatever that if the Association with which Mr. Barrington Kennett was associated could show that this pollution could be done away with, at a profit or without unreasonable expense, Parliament would have no hesitation in

passing such an Act as would prevent the pollution of rivers. But there was considerable doubt on this last point. There was not sufficient belief in the practicability of doing so to induce Parliament to make it compulsory. There was a fear that it might interfere with some of our industries. If it could be clearly shown that it would not do so in any particular cases it would be well for those cases to be treated alone, and the powers might not be made entirely general; for instance, he would refer to one instance mentioned by Mr. Barrington Kennett, of pollution of streams by the manufacture of flax. In the north of Ireland, at a certain time of the year, the flax was steeped in the ponds to prepare it for market, and any one who had travelled there knew the extremely offensive character of the smell when the flax-water was passing away; but if a compulsory measure were to be passed, saying that every small farmer in the north of Ireland was to be prohibited letting flax-water run down the streams, there would be a rebellion. There were certain other cases, however, in which it could be shown that pollution could be prevented without expense, and in those cases the law should be enforced in the first instance; but he feared there would be a difficulty in making the Act applicable to every industry. It must not however be supposed that he did not fully appreciate the importance of having all the rivers rendered pure, when it could be done.

Another thing which weighed with a great many was this: it would not do merely to take away the matters in suspension in the water, and return it to the streams apparently pure, if it were not chemically pure, so as to be fit for use. If, for instance, some system were invented by which gases were rendered so far pure as to have no

smell, that would not by any means be desirable ; gas was a dangerous thing when it escaped, and it was a good thing that it did smell, so that attention was drawn to it. In the same way, if there were means by which water could be returned clean and limpid into the streams, but still containing noxious matter in solution, it was felt by many that there would be great risk, because the public would assume that the water was pure and fit for use. The country at large would be greatly indebted to the Manufacturers' and Millowners' Mutual Aid Association if they could show that they could purify the water and send it into the streams in a fit condition for general purposes. It would be a great gain, however, in his opinion even to take out the foul matters held in suspension ; and it would soon become known in the neighbourhood what streams were not fit for drinking water, in the same way as it was well known in Switzerland that snow water was not fit for ordinary consumption. Any one who had travelled there would remember that he was often told by his guide that he must not touch some particular stream, because it was snow water, and they would point out some other source where the water was unobjectionable. This question was one of very general interest, and he begged to move a hearty vote of thanks to Mr. Barrington Kennett for the Paper he had read.

Mr. BALDWIN LATHAM, in seconding the vote of thanks, said he was sure that when these questions came to be considered by the manufacturers themselves they would receive very great benefit from studying the Paper. The great object of the Manufacturers' and Millowners' Mutual Aid Association was first to get the rivers purified, and secondly to aid the mill-owners and manufacturers in so

doing. For nearly ten years there had been an exceptional state of things in regard to the rivers of England, which, during the whole of that period, had had much more than the ordinary supply of water. Such things had occurred in the past, and it was only to be expected that in the future they might anticipate a more than usually dry period, and when that came the pollution which was now going on would be made much more apparent. It was not only a question of pollution by sewage, but from manufactures, and there was very little doubt that there was an immense evil arising from the destruction of fish from this source. Some few years ago he recollected that after a dry period there was a surprising quantity of a particular kind of fungus, commonly called "sewage fungus," in a particular spring water; this fungus was submitted to Dr. Smee, who ascertained that it was the same description which destroyed so many fish in the rivers. That arose mainly from cesspools and drainage from manufactories, passing through a gravel soil; and that showed the importance, not only of dealing with visible means of pollution, but with those which were hidden from view. Many manufacturers and others used a system of percolation of foul waters to get rid of them, but this could hardly take place without some ill-effect on neighbouring streams. After some experience, he might say he did not know of any manufacturing water that could not be purified. The most difficult was tan water, but that was done by the speaker, with the assistance of the late Professor Way and Mr. C. G. Cresswell, in the tanneries at Nantwich, and the water made as clear as crystal, and passed into the rivers without any injury whatever. The principal agent used in the process was the refuse lime employed in the tanneries; in fact, by using

lime-water, after a proper treatment with chemicals, the whole tannin was precipitated as tannate of iron ; the liquor was subsequently filtered, and the effluent, after being oxidised by means of a very porous filter of burnt ballast, passed into the river as clear as crystal. With regard to the machinery for the automatic distribution of chemicals he had in the course of his experience had to advise the use of an apparatus of the kind, but he had no special process of his own, and whatever he had done could be copied by any one. There was no difficulty whatever in making the whole treatment by chemical process perfectly automatic, so that the expense was reduced to a minimum. Even on the very smallest works it might be done most effectually. The object of the Association was to aid any person who had any invention which promised to be of service in bringing about the great object they had in view. One matter he might mention which showed one of the weak points in the Rivers Pollution Prevention Act. Any one reading the Act would say that it was prohibitory to turn solid matter into the stream, but when you came to the question of what was solid matter, the definition clause said "solid matter shall not mean matter in suspension." Now, as all solid matter was put into the rivers in a state of suspension, the Act was absolute nonsense. The only alteration required was to change that one word "suspension" to "solution," which no doubt was what the draftsmen intended ; at present solid matter was passed into the rivers to an enormous extent, whereas solid matter in solution, unless it was poisonous, was not injurious ; in fact some rivers contained an enormous amount of matter in solution, but were not at all dangerous. He was himself engaged in a prosecution of mill-owners, where solid matter had caused the death of fish, and he knew a case on the

Wandle where a machine called a "devil" was used for tearing up old carpet, the dust from which passed into the river in such vast quantities that it filled the gills of the fish and suffocated them.

(The vote of thanks was carried unanimously.)

Mr. C. N. CRESSWELL also bore testimony to the high value of the Paper. He thought there could be no doubt in the minds of his hearers that Mr. Barrington Kennett had shown satisfactorily that where there was a will to purify the rivers there certainly was a way. Those who had worked for years, long before 1862—which his friend Mr. Burchell put as the commencement of legislation on this subject—to produce some result on public opinion, and through public opinion on the Government, had never been backed up as they ought to have been; and for that reason this Paper was valuable, inasmuch as it contributed to the enlightenment of the people on an important national subject. The duty of every constitutional government was to assist in the formation of public opinion, not to anticipate it, and therefore if they wanted Government help they must first put themselves into a position to help the Government, and stimulate their action in the matter. What was the position of the public on this question? One would suppose, from the enormous crowds who visited this Exhibition, that they all took a lively interest in pisciculture—that is the propagation and conservation of fish—and therefore necessarily in the purification of our streams. Yet when they came to pick out individuals from the visitors to the buildings belonging to the Native Guano Company and the Manufacturers' and Millowners' Mutual Aid Association, they were able to detect four or five distinct types of mind and character. The first class

were persons who positively received with surprise the information that there was any pollution going on in the rivers at all; it was a new light breaking upon them when they were told that the rivers of the United Kingdom, with scarcely an exception, were polluted to such an extent that they were neither fit for man nor beast. They received it as a new revelation, and went away wondering that such a state of things could exist. He did not like to be unpleasant, and say that those people were stupid; indeed he was afraid that the great majority of the people of this country were stupid on this subject. There was a very old proverb that even the gods themselves did not know how to deal with stupid people. Another type was the influential country gentleman, the Member of Parliament, Chairman of Quarter Sessions, or of the Local Board of his district. He remembered in particular one important man, who said, with a great deal of candour, that he thought he was bound as a public duty to set an example to his neighbours, and he therefore set to work to prevent the pollution of the river which flowed past his works. He found it to be a very expensive proceeding, but still he was willing to bear that in consideration of his position; none of his neighbours were compelled to do likewise; and after a few years, having gone to considerable expense in doing his best to keep the stream pure, he had seen that those above and below were polluting it the same as ever. There was no use in isolated action like that; compulsion ought to be uniformly brought to bear throughout the country. The gentleman to whom he referred took a great deal of interest in what was said to him by the scientific men connected with the Manufacturers' and Mill-owners Mutual Aid Association. He seemed impressed by it, and said that he should communicate with them;

indeed it was hoped he would become a subscriber and supporter. Many years ago he was consulted with reference to Leeds, which was suddenly called upon to cleanse the Augean stable, and put its house in order ; and the different companies established to promote sewage utilisation and disposal had a fair field and every possible favour, provided they spent their own money, and did not damage the Corporation property. Inasmuch as the Sewage Committee of the Corporation had for its chairman one of the shrewdest and most intelligent men in Yorkshire, they could well understand that Leeds was for two or three years practically cleansed at the expense of the various enterprising companies which abounded in those days. The tanneries, dye-works, woollen factories, &c., at Leeds, had brought about a state of things which was not at all exaggerated in the Paper. He recollected his son being sent down in his professional capacity to superintend a chemical experiment that was going on. He reported that one day the colour of the river was red, another day it was green, a third day it was black, and the fourth it might possibly be yellow, but it never was clear. The colour depended entirely on the caprice of the public, and the fashion of the dye they most affected. There was no difficulty, however, in dealing with it ; but Leeds found that, after having obtained at enormous expense an excellent specific for their special difficulty, not a single town above them on the river was called upon to do likewise. As the President of the Sewage Committee said to him, what would be the use of their pouring water as clear as Apollinaris into a river which flowed by them as black as ink ? Another great obstacle was the strong impression on the minds of manufacturers that they had a prescriptive right to pollute the rivers. Indeed, in the

old law books it would be found that when a man was charged with the pollution of a river, and an attempt was made to obtain an injunction or to support an indictment, they put in a plea that from time immemorial they had a right to pollute that river, and intended to exercise it. He had heard men of the highest position say: "My father and grandfather polluted the Aire and Calder river, and I intend to do the same. Why should I be deprived of the right without compensation?" If he were reminded of his duty as a legislator, his reply was: "That is all very well, but everybody in this country must take care of himself." Then if it were said: "How about the poor unfortunate people below who want pure water?" the only reply was: "If people are foolish enough to go down the river instead of remaining where I am, God help them!" However, the Act of 1876 had put an end to that argument, and prescription could no longer be pleaded. There was another very important class of objectors, the scientific objector. He believed Mr. Robert Rawlinson had changed his views very much within the last twenty years, but he had heard him say that it would be a fatal mistake in this country to commence cleansing the rivers by removal of pollution unless it were done all over the country uniformly on a scientific system. For instance, he said, if operations were simply confined to the exclusion of *sewage* from the rivers in Yorkshire and Lancashire, they would no doubt be doing a great good to the country; if at the same time *manufacturing refuse* were excluded, much further good would be done, because the streams would then become what they were intended by Nature to be, the great arteries of the country, supplying food to man and animals; but one should not be done without the other, for if the sewage of

the great towns were allowed to fall into the rivers, the manufacturing refuse must also be allowed to flow in with it; the one neutralised and cancelled the other, and therefore the subject should be dealt with completely or not at all. He believed that to be a perfectly scientific and justifiable observation. Now, having to deal with these four or five classes of objectors, it might be said, How could so grave an obstacle to progress on this question be overcome? There was but one remedy—and that had been admitted by the Society of Arts and other kindred institutions—the intervention of the State, of course through constitutional methods. It seemed to him that to-day, if they were to do anything practical towards effecting that much-desired result, it would be well to arm the Council of the Fisheries Exhibition with something in the form of a resolution, and request their powerful intervention with the Government, whose ear they had. Something should be done, if not in the next session, certainly within the next two sessions, to amend the Acts of Parliament already existing, and to give greater stringency to the provisions already to be found on the statute book. It was true that the Rivers Pollution Prevention Act, after twenty years of gestation, was brought forth in the year 1876, and they thought at first that they had attained the summit of their hopes; but all those hopes had been dashed, and everybody who knew anything about the operation of the Act, or had to advise upon its construction, confessed that it was absolutely inoperative. Mr. Baldwin Latham had pointed out one great defect, and he could point out others. One of the definitions was this—that pollution should not be held to include innocuous discoloration; so that you might make the river all the colours of the rainbow, and that would not be

pollution within the meaning of the Act. It might meet the objection made by Colonel Leach, that it was dangerous to make the water too clear if it was not perfectly pure; but as long as the Act stood as it was at present there need be no fear of that risk; it would always be red, black, or green, and nobody would think of drinking it. With regard to that objection, he might fairly say that if they were to abandon all efforts to effect anything like improvement in the purification of rivers until they were able to obtain that which they all wished, namely, perfectly *pure* water, they would have to boil the rivers, which, though nothing was impossible to engineers, would be rather an expensive operation. The Act of Parliament went to some extent in the right direction; it declared that to be a misdemeanour which never was one before—that was something; and if there were any discredit attached to polluting the rivers, as there was to stealing one's neighbour's purse, it would be a good thing; but heretofore everybody sympathised with everybody else, and there was no disgrace whatever attaching to it. If you had an Act of Parliament, you must have power to put it in force; and the real cause of the inefficiency of this Act was that there was no power in the country to enforce it; on the contrary, those authorities which had more to do with it than any one else had a strong interest the other way. The Act said that if you had reason to complain you could take proceedings before the County Court, but through the intervention of the sanitary authority; if they would not do it, you must go to the Local Government Board. The sanitary authorities were the greatest criminals of all; there was hardly one that was not polluting the streams around it. The question was how the Act could be amended. It seemed to him there were two ways of doing it. They hoped next year to have an Act

passed for the conservancy of rivers ; and in the Bill originally drawn there was power taken for the Conservancy Board to enforce the provisions of the Rivers Pollution Prevention Act ; unfortunately, last year the clause was expunged. They might ask the Government to re-introduce the clause. In the next place they were told that if this Government were able to carry any Bill at all affecting social amelioration, it would be the County Boards Bill ; well, three years ago the Society of Arts passed a resolution that the very best possible authority to be armed with the power of enforcing the Rivers Pollution Prevention Act would be the County Board, because they were taken from a larger area, and were not likely to be influenced by personal considerations or petty parochial politics. He believed that County Boards would be the means to which they would eventually have to look to see the Act enforced. He would therefore move the following resolution : “ That, having regard to the great and increasing national evils caused by the pollution of the rivers of the kingdom, the Executive Committee is respectfully requested, through the Chairman of the day, to press upon Her Majesty's Government the urgency of effective legislation in the next session, in order to enforce the prohibitions contained in the Rivers Pollution Prevention Act of 1876.”

Mr. HENRY STUDDY seconded the resolution, which was carried unanimously.

Sir AMBROSE SHEA said he could not profess to have any practical knowledge of this matter, but he could fully appreciate the enormous importance of it, and had listened with a great deal of pleasure to the very able paper which had been read, and to the observations which had been made ; and he begged to move a vote of thanks to the Chairman for the able manner in which he had conducted the business

of the Conference, which was not the first occasion on which he had noticed the devotion which Mr. Crossman had given to the interests of this great undertaking, which was now approaching so triumphant a termination.

Mr. CORNISH, in seconding the motion, said he had lately been having some fishing in France, and he found that in certain Departments the rivers were perfectly pure, as in the Somme and in other parts ; whereas, for instance, about Paris, where the rivers ran into the Seine, the water was foul, and they could not get any fish. He therefore came to the conclusion that if this Act were put into operation it would be a great benefit, even if it were enforced in particular watersheds only. He did not think the Act could be enforced all over the country at once, but they might eat the artichoke leaf by leaf.

Mr. HANSON (Wakefield) said there was no doubt that rivers were polluted ; the sole question was, were there means by which those pollutions could be avoided, especially with regard to mill-owners' refuse ? He could mention several cases in which complete purification had been effected ; at Olden Clough the proprietors of a large woollen cloth factory had been obliged by an injunction to purify their foul water, and the water was now so purified that the manufacturers below could use the water freely. In another case a paper-mill company had an injunction against it, and there the purification was effected by the black-ash waste process. The river Calder happened to be in the very town in which he resided ; it was the receptacle of the sewage from a portion of the Manchester district, representing four to five millions of people, and was not purified at all before coming to Wakefield. This water was supplied through the mains, and they had no other drinking water, so that when at home he always had

to have it for his tea or his coffee, and for his friends for their whisky. It had been asserted to be as black as ink, but the people did not suffer in health, and the only reason he could suggest was that it passed by a tremendous mountain of black ash, the water from which percolated into the river and destroyed the organic matter, and prevented their being annihilated ; in fact, the death rate was four per thousand less than at Leeds. He had also been successful in purifying the effluent water from tanneries. There was, no doubt, necessity for further legislation.

The vote of thanks having been carried unanimously,

The CHAIRMAN, in reply, said he had never presided at any meeting in which he had been so much interested. It seemed a monstrous thing that in a country like England, which prided itself on being ahead of all civilised countries, there should not be a single river free from pollution. He hoped that, public attention being called to this serious state of affairs, such a pressure would be brought to bear upon the Government that some benefit might arise. Although the audience was small, the Paper would be printed by the Executive Committee, and would no doubt be largely circulated, and, he hoped, would not be without effect.

Mr. BARRINGTON KENNETT also briefly returned thanks for the vote of thanks which had been passed to him.

**PRACTICAL
FISHERMEN'S CONGRESS,**

COMPRISING THE FOLLOWING SUBJECTS :

DESTRUCTION OF IMMATURE FISH.

HARBOUR ACCOMMODATION.

BETTER MEANS FOR PREVENTION OF LOSS OF LIFE AT SEA.

RAILWAY RATES.

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PRACTICAL FISHERMEN'S CONGRESS.

FRIDAY, OCTOBER 26, 1883.

EDWARD BIRKBECK, Esq., M.P., in the Chair.

THE CHAIRMAN said he had great pleasure in opening the Practical Fishermen's Conferences, and on behalf of the Executive Committee, of himself, and the public, he thought he might say that no greater interest could possibly have arisen in connection with these conferences than the final ones, which were to be discussed, as he hoped, by practical fishermen themselves. The subjects placed on the agenda were all matters of vital importance to the fishing interest, and to the public at large, and he proposed to take them in the order in which they appeared. The first was as to the destruction of immature fish; the second, harbour accommodation; the third, better means for prevention of loss of life at sea; the fourth, railway rates; and an additional one had just been sent in, namely, the question of fishing vessels' lights. All those were matters of very great interest, and he was quite sure that when the time came for all the unique collections which would be published by the executive committee, of all the discussions which had taken place, together with the essays

and the handbooks which would be printed, that the Practical Fishermen's Congress would form a most interesting and important addition to that work. He had now great pleasure in opening the question of the destruction of immature fish. It was a subject which had already been discussed to a great extent by various authorities, some of them very high authorities indeed, and by some of their foreign friends who had attended the conferences. The matter had never been placed on the agenda before, though it had been indirectly introduced into various discussions, prominently by Professor Huxley, when he alluded to the question in his opening address. He was himself more and more impressed that it was a subject of the greatest possible difficulty, and he thought that many persons had not borne in mind that it was an international question, and one that it would be impossible for them as a nation to deal with alone. If anything is to be done, in his opinion, it must be done in an international point of view. In saying that, it must be palpable to every one that they had no jurisdiction as a nation beyond their territorial waters, which is the three-mile limit. Therefore, supposing for one moment that any Bill was introduced into Parliament as affecting the destruction of immature fish, it could only have jurisdiction within the three-mile limit, so that if the English fishermen were to be in any way restricted in the capture of immature fish, the French, Dutch, Germans, or any other nation could do what they liked just beyond that limit; they could laugh at the English fishermen for being restricted, and could capture any amount of immature fish and send them to the foreign markets or to the English markets. Therefore, an injustice would be done to the English fishermen if they were restricted and the foreigners were

allowed to do what they liked. That being so, it was clearly an international matter, and one which alone could be brought to a satisfactory conclusion by an international conference—he did not mean such a conference as had taken place at the Exhibition, but a duly authorised conference such as took place at The Hague two years ago, a conference in which he was specially interested, and worked hard for many years to obtain. The Conference at the Hague was a most satisfactory one, and if anything was to be done to prevent the destruction of immature fish, it would possibly be done upon the same lines as upon that occasion. With regard to the destruction of immature fish, Mr. Jex, who had kindly consented to introduce the subject to the meeting, would point out what was going on in all directions; he would probably refer to the size of the mesh of the nets used round the coasts of the United Kingdom, and the sizes of the fish brought into the market; but there was another point which he wished to mention, namely, that probably the scarcity of fish had arisen in a great measure from the extraordinarily increased demand. Fish was now sent to every town throughout the kingdom by means of the railways and the parcels' post, and he had learned on excellent authority that even through the Exhibition the demand for fish had palpably increased, no doubt owing to the cheap fish dining-room, in which an enormous quantity of fish had been consumed. Even Boards of Guardians were now giving fish dinners to the paupers once a week, which in itself would create an increased demand. No doubt the fishing-grounds had been fished to a most extraordinary extent, and owners had now to send their fleets and smacks to a distance which was never contemplated years ago. All he could say as regarded the Exhibition

was, that he confidently hoped there were inventions which had been exhibited which would enable the owners to prosecute their fisheries at a far greater distance than they contemplated before, and in that way the supply might be kept up. He alluded especially to the adoption of steam. The Executive Committee at the outset, when they framed their classification, thought it was most important that a special prize should be given for the best trawl net for preventing the destruction of immature fish, and though the report of the Jurors in connection with those exhibits had not yet been made public, he had had an opportunity of reading it, and he regretted to say that the Jurors could not find any exhibit in the Exhibition which was worthy of the special prize that the Committee offered. One point which had struck him, as regards this great question, was that it might be found by an International Conference, or by the Legislature, that a move in the right direction would be to pass a law prohibiting the sale of immature fish. He did not wish to express an opinion strongly one way or the other, but it was a point which is worthy of consideration. If the smack owners sent small fish up to market, whether it was to Billingsgate, Birmingham, Manchester, or anywhere else, and they found that the sale of small fish would not be allowed, then he felt confident that they would at once come to the conclusion that it was not worth their while to pay the excessively high railway rates which they had to pay, and have their fish confiscated. He had very much pleasure in calling upon Mr. Jex to introduce the subject of the destruction of immature fish.

Mr. JEX said this was a vast and important subject, not only to English fishermen, but to all nations of the world. Immature fish were being destroyed, not only by British

fishermen round the British coast, but by fishermen of all countries fishing in the same waters, and even in all parts of the world. That Conference had more particularly to deal with the destruction of immature fish upon the British coast, and therefore he would take the matters in proper rotation. He trusted that after many gentlemen had expressed their opinions in that room, the further consideration of the subject would be adjourned until there was a better representation of fishermen present, and that the wardens of the Fishmongers' Company would consent to lend their hall for the purpose of the matter being further discussed in the month of January. Drift-net fishing was in full operation as well as the trawl-net, and long-line and hand-line, consequently the present was a most inopportune time for holding the Conference. In the fishing population of the British islands, he might say there were not nine out of ten who believed in theoretical men, but rather in the practical man who had worked from his boyhood in every branch of fishery. One gentleman, who was a very high theoretical authority, lately said that the fishermen of England should be allowed to use what net they liked, to fish when they liked and how they liked, but that was what he should call extermination. Many of these theoretical people put views before the practical man that the practical man would not look at at all, as they were wrong altogether, and he did not think he should be far wrong in saying that ninety-eight out of one hundred of the fishing population did not believe in them. In the first place, he would deal with the drift-net fishery. Before the repeal of the Sea Fisheries Act, in 1868, no one could use a net for the capture of herrings with a mesh of less than one and a quarter inch, but since the repeal of the Act he had measured no less than twenty herring

nets with a mesh of thirteen-sixteenths of an inch at Yarmouth and Denes during the past week. The nets to which he referred were particularly used by his brethren from over the border, the Scotchmen from Banff, and that neighbourhood. When these nets were used, they were acted upon by the action of the sea, the result being that the large fish which struck the net were nosed, the greater proportion of the large fish being lost, and only the small taken. He thought it was quite time that the Government took the subject in hand, and defined the mesh of net to be used. He quite agreed that the mesh should not be forced upon British fishermen unless a convention could be made with other countries, with all the fishermen fishing in the same waters. The mackerel net was used in much the same way as the drift-net, but the mesh of that as used by the people on the east coast was twenty-seven meshes to the yard, and was used in the same way, but many were now using thirty-two and thirty-three meshes to the yard. No doubt that acted in the same way with mackerel as the drift-net did for herrings. Of course they could not make a convention as to that without all the other countries agreed. Pilchard were captured by the drift-net of forty to forty-two meshes to the yard, and the question now for consideration was whether the mesh was too small or too large. That subject was one which he hoped the practical men now present would deal with. The garvie or sprat was also caught by the drift-net, and he held in his hand a sprat-net obtained from Leigh, in Essex, of a very small mesh, and, of course, those present would understand that the mesh was smaller when wet than when in a dry state, the consequences being, that when such a net was used the small fish could not escape. It had been said by gentlemen of high theoretical authority

that the herring was some two or three years in arriving at maturity ; but he was prepared to show that the herring, from the time it left the parent fish, became a full-sized fish in the space of twelve months, thus proving that theoretical men knew very little of the subject. When the fish matured, it shot its roe in a temperature suitable to the good ripening and coming to life in from ten to forty days, and if the little insect life escaped its many enemies, in seven weeks it became from $2\frac{1}{2}$ to 3 inches long ; when in the months of February and March they had arrived at a length of from 6 to 7 inches they were caught as spring herrings, and very often for bait. The trawl-net fishing was one of the most important industries of the British Islands, and upon the table before him there were specimens of small soles, haddocks, and plaice which had been sent to Billingsgate Market that morning. Thirty years ago he worked in a trawler from Yarmouth, as a cabin-boy to Mr. Richard Yaxley, when but a small number of vessels left that port ; but now Yarmouth numbered 600 sail of vessels in the trawl fishery, and quite that number in the drift-net fisheries, and the tonnage of each vessel upon the average is double the tonnage that it was in his early days. In those days they had only to go to the Knowle, a short distance from Yarmouth, say from twenty to thirty miles, to obtain the fish, and in one night he had seen captured on board the little vessel upon which he was, eight to ten double of soles, and a very large number of plaice and haddock ; the soles being sold at 7s. to 8s. per double, but at the present time they fetched £6 per double. Many people wondered why trawl-fish should be so dear, but as the Chairman had stated, he thought the great increase of population had much to do with it. Referring

to have it for his tea or his coffee, and for his friends for their whisky. It had been asserted to be as black as ink, but the people did not suffer in health, and the only reason he could suggest was that it passed by a tremendous mountain of black ash, the water from which percolated into the river and destroyed the organic matter, and prevented their being annihilated ; in fact, the death rate was four per thousand less than at Leeds. He had also been successful in purifying the effluent water from tanneries. There was, no doubt, necessity for further legislation.

The vote of thanks having been carried unanimously,

The CHAIRMAN, in reply, said he had never presided at any meeting in which he had been so much interested. It seemed a monstrous thing that in a country like England, which prided itself on being ahead of all civilised countries, there should not be a single river free from pollution. He hoped that, public attention being called to this serious state of affairs, such a pressure would be brought to bear upon the Government that some benefit might arise. Although the audience was small, the Paper would be printed by the Executive Committee, and would no doubt be largely circulated, and, he hoped, would not be without effect.

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PRACTICAL FISHERMEN'S CONGRESS.

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were convicted and fined £10 (about equal to £100 at the present time) for fishing with small-meshed nets and unlawful engines for taking small fish. In the reign of James I., very strict measures were enforced for the suppression of the use of the illegal nets then employed by fishermen in trawling on our coast. For example:—On 13th April, 1619, the Mayor of Rye wrote to Lord Zouche, who, as Warden of the Cinque Ports, was *ex officio* in fishery jurisdiction and affiliated to the Admiralty, announcing that certain fishermen were taken off that part of the coast for fishing with unlawful nets. Similar proceedings occurring from time to time produced such beneficial results that on the 27th February, 1621, the Mayor of Rye again writes to his lordship, conveying to him the thanks of the fishermen of that port for his action in directing the suppression of unlawful nets. Similar cases could be quoted at other parts of the coast, proving that the fishermen, as a rule, were up in arms against the abuses caused by small-meshed nets.

The Mayor of Hythe wrote to Lord Zouche on 7th March, 1622, complaining that the fishermen of Rochester and Stroud, who were trawling off that port with illegal nets, resisted his interference, but would answer any accusation at London. Therefore he (the Mayor) requests his lordship to take action thereon without delay, adding that his town is ruined by such proceedings. In the reign of Charles I., illegal and small-meshed nets, sometimes used by the French, Dutch, and by our own fishermen, caused considerable notice, and stringent measures were adopted from time to time to suppress this nuisance. In the year 1630, Viscount Dorchester, one of the principal secretaries of state, to whom this great fishery question was entrusted mainly at the King's request, was inundated with petitions

from the fishermen from all parts of the coast, complaining of the small size of the meshes of the nets used by some trawlers, and with suggestions of various new regulations for correction of abuses in this description of fishing. Many different opinions were submitted, but it was on all hands agreed that the deterioration of the sea fisheries was attributable to the destruction of the fry, consequent upon the use of improper nets both by foreign and English fishermen. During the interregnum we find the Cromwellians following the policy pursued by the Cavaliers with regard to this question, and the good old regulations, whereby the use of the small-meshed and other illegal nets was prohibited, were then enforced with the utmost rigour of the law, and when any illegal nets were found on board any trawler, or in possession of any fisherman, the nets were seized, confiscated, and invariably burned. Several instances are preserved amongst the Admiralty records, formerly kept at Harwich.

Immediately after the Restoration, Charles II. and his ministers of state directed special attention to this question. The mesh of the trawl-net was regulated and fixed at various standards.

From the time of James II. to the accession of Queen Anne, somewhat similar regulations were enforced, and the great increase in the number of trawlers upon the English coast at this time, combined with the quantity of fish they caught, proves the wisdom of our ancestors in adhering to the due observance of those salutary measures, and, what was of more importance, the vessels had not to proceed far out to sea, and in a comparatively short time returned to port laden with good catches. The wanton destruction of immature fish, which we now see on many parts of our coast every time the trawl-net is heaved on deck, was utterly unknown in those days, and the abuses

perpetrated under this head never were prominent until the statutory mesh of the trawl-net ceased to be noticed by the Government.

The principal fish taken by the trawl-net are :—Turbot, sole, brill, dory, mary, cod, plaice, haddock, red and grey gurnard ; also the sapharine or tubfish, whiting, weaver, sand dab, skate, ray, red mullet, hake, ling, coal-fish, cat-fish, conger eel, halibut, sturgeon, and often large quantities of oysters, with a few crabs, and by chance a lobster—plainly showing there is very little escape wherever the trawl-net, as now in use, passes over, more particularly by the nets used by vessels south of Great Grimsby to the Land's End ; and we find the same abuses in the size of the mesh on the west coast of England.

Before closing his remarks upon this important subject, he would give the size of the cod end as used in the trawl-net at several of the principal fishing ports ; but, before referring further to them at present, he would first of all address himself to the fundamental and all-important question with which he started : Have the trawl fisheries of England deteriorated ? In answer to this pertinent question, most emphatically he would say, yes, they have, and will still continue deteriorating, unless such legislative action is taken similar to that which had such salutary effect on the fisheries in the reigns of Edward III., Henry VII., James I., Charles I., Charles II., James II., and other monarchs since that time, as well as during the Commonwealth, and compel the fishermen of to-day, as then, to adopt certain well-defined remedies.

The next point of the subject with which he would deal was the seine-net fisheries. The seine-net now in use around the British coast was one of the most destructive nets possible. The net was frequently taken from off shore by a

seine boat, the net being shot some distance at sea and brought into land by a tender. There were various kinds of seine-nets, all of which did an incalculable amount of harm ; he himself having seen large heaps of small fish taken out of them and left upon the shore for the next tide to wash away. When in France some short time ago, a deputation of fishermen waited upon him at Boulogne, and they agreed with him as to the destruction of fish upon their coast, and informed him that the French Government would not allow a seine-net to be used. He asked them if they had any stake-nets ; at first they said they had not, but afterwards admitted that they had, though they were twenty-seven meshes to the yard, and were anchored nets for the capture of herrings. He noticed some thousands of pairs of soles in Boulogne market which were not four inches long, and hundreds of little skate and ray. The French fishermen agreed with him that the fisheries were being ruined, but they put it down to the small nets used by the shrimp boats. From the red shrimp nets which he held in his hand, and which were used at Gravesend and that part of the coast, it was plain that anything which got into it must be destroyed. They could not exactly stop shrimp fishing but still some provision ought to be made as to the distance at which the shrimp boats should work from the bays and headlands, and there should be a specified mesh of net which they should use. What they had to look to was the food of the masses, and as it was clear that a large amount of fish was destroyed by this class of fishing, it was evident that the shrimp-fishing was a subject which required to be investigated. The fishermen in France to whom he had referred said that they would write to the Minister of Marine in order to induce him to enter into a convention with the British Government to put a prohibition upon the

use of small-mesh nets. Having exhibited to the Congress the cod end of a trawl-net used from the port of Leigh, the mesh being about three-eighths of an inch, he said that it was monstrous that such a net should be allowed to be used. He quite agreed with the Chairman that they could not force a close time, or insist upon an enlargement of mesh of net without a convention of all nations. The Yarmouth fishermen very truly said that if they did not catch the spring herrings the Frenchmen would do so, but he maintained that it was a great shame that fish were not allowed to arrive at maturity. He had known midsummer herrings to be sold upon the beach at twenty-five shillings per hundred, but now it would not pay to send boats out to catch them. He did not intend to go into the question of long-line and hand-fishing, as that was the fairest mode of fishing there could be. Of course no one could stop the most minute fish from taking the bait upon a long line, and he held in his hand two small cod which had come all the way from Newfoundland, proving that small fish were caught in all parts of the world. He would not detain the meeting further by any remarks, but should be most happy to answer any questions which might be put.

Mr. CAPPS (Lowestoft) said he was a practical drift fisherman, having been acquainted with fishing all his life. Some time ago Mr. Frank Buckland held an inquiry at Yarmouth upon the subject of Spring Herring Fishery, and after taking a deal of evidence, that gentleman had come to the conclusion that the spring herring fishery did no harm. It was well known in Yarmouth that if a spring herring lived for ten years it would never become a midsummer herring. Vessels commenced fishing about seventy miles east by north from Lowestoft, and there they caught the spring herring, which was not a young herring, but a

herring which had shot its spawn in the early part of the spring. There were always some fish which had not shot their spawn, and the fact that some of these spring herrings were caught late in the year with hard spawn in them, which they had been unable to discharge, proved that they were not young fish, and as spring came to an end, these fish came in to within twenty-five miles of Yarmouth, and till ultimately the spring-herring fishery finished at a distance of twelve miles off the shore. At the termination of the spring-herring fishery upon the 20th of May, it would be found that the fish were not so large as at the commencement of fishing. This conclusively proved that spring herrings were not young herrings. A spring herring and a midsummer herring being shown to Mr. Buckland, the question was put to him whether, as an amateur fisherman, he could bring his mind to believe that herring would grow from this size in the latter part of May to the middle of June, and he said that it was an impossibility, and that he was perfectly convinced that the fishermen of Lowestoft were right when they said that a spring herring and a midsummer herring were not identical. Another argument in support of this view was that during the spring herring fishery, although a large number of fish were left in the water, and it was thought that in consequence there would be enormous catches at midsummer, it turned out, although there were over one hundred boats fishing during the midsummer season, not a single boat paid its expenses. This to his mind conclusively proved that the spring herring and midsummer herring were not identical. He also agreed with what Professor Huxley said at the Norwich Exhibition, that drift fishing did not diminish the quantity of fish. Professor Huxley proved that cod devoured more

herrings than all the vessels caught in the year ; that a cod of average size would take from eight to ten herrings at a meal, and he made a calculation of the number of cod, and comparing it with the number of herrings caught, he proved that cod devoured more herrings than were taken by the boats. Mr. Jex had very rightly said that herrings in the summer season fetched as much as twenty-five shillings. He (Mr. Capps) had seen them fetch a guinea, and he had also sold spring herrings for a guinea, so that supposing both were sold for the same price, it mattered very little to fishermen whether they sold them at a guinea in the spring, or at a guinea at midsummer, for it came to one and the same thing. He quite agreed with what Mr. Jex had said as to the small mesh used by Scotch fishermen, though he could not agree with him altogether about the fish being knocked out of the nets by the action of the boats. With regard to Mr. Jex's remarks as to nets used by the Yarmouth fishermen, he thought that gentleman had been misinformed, as the Yarmouth and Lowestoft men used a net of thirty-one meshes to the yard. Mr. Jex had also been misinformed as to the mackerel-net used upon the east coast, as no net with a mesh smaller than twenty-six to the yard was ever used. If any law could be passed that would affect all nations, no body of fishermen would be more pleased than those of Yarmouth and Lowestoft, though he should very much regret if the House of Commons interfered with an industry which now employed a very large number of men, and which if interfered with in an undue manner would produce most disastrous results. He hoped the Conference would not be concluded that day, but that the matter would be well thrashed out at a future time when there might be some practical effect from the Exhibition.

Mr. Alderman STAPLES (London) said that although he

was not a practical sea-fisherman, he had taken a very active part in the inquiry lately made by the Corporation of London with regard to the fish supply of the Metropolis. What struck him most, in looking over the Exhibition, was that everything was done for the destruction of sea-fish, and nothing for their protection. In fact, the sea-fish did not appear to have any friends in the Exhibition. He thought that the prevention of the destruction of immature fish ought not to be the only object of this section of the Congress, but that artificial propagation of sea-fish ought also to be considered. Many of the fishing-grounds around our coasts were not as well stocked as in former times, and some places appeared to be entirely deserted. Our fishermen were now compelled to go a distance of three or four hundred miles in order to obtain their supplies of fish, which ought to be found nearer home at less expense. Much had been done for the protection and propagation of salmon in this kingdom, from the fact that large numbers of people have vested interests in salmon rivers ; but no one had such interest in the open sea, and consequently nothing was done there for the preservation of the fish. The world at large is interested in the supply of sea fish, and he contended that the interests of the people could only be preserved by means of legislation. He quoted, in support of this statement, an Act of Parliament to prevent the sale of crabs and lobsters under specified sizes, which had exercised a very beneficial influence on the supply, and suggested that similar restrictions should be placed on the capture of very small fish. The American fisheries enabled us to estimate the evils produced by excessive or improper fishing. Within fifty years no waters of the same extent in the world could show such numbers of shad and herring as the Potomac

river, below the Great Falls. In the year 1833, 25,500,000 of shad were taken by the Potomac fisheries, as well as 750,000,000 of fresh-water herring. In the year 1878 the catch of shad had dwindled down from 25,500,000 to 224,000, or less than 1 per cent. of the yield of 1833; the catch of herring was also reduced from 750,000,000, in 1833, to 5,000,000 in 1878, again less than 1 per cent. of the yield at the first-mentioned period. In the year 1878 upwards of 12,000,000 eggs of shad were taken in Albemarle Sound and distributed to all parts of the States, with generally satisfactory results. Experiments made at Gloucester Sound showed conclusively that the sea-herring could be multiplied artificially on a sufficiently large scale for economical purposes. But the most important success of the United States Fish Commission was the hatching out of several *millions of cod*, and planting them in the ocean adjacent to the harbour of Gloucester. Special arrangements were of course necessary, as the principle is diametrically opposed to that adopted in connection with fresh-water varieties, the eggs of the cod family being non-adhesive, and floating freely on the surface of the water. The same system can be applied for hatching out haddock, mackerel, halibut, and other species. He thought the British Government should be urged to take the necessary measures to remedy the deficient supply of fish round our coasts, and to establish at least one experimental station for the culture of sea food-fishes, this being a national requirement beyond the province of private enterprise. He confidently believed that if a vessel were constructed and anchored in the proper quality of water, an enormous propagation of sea-fish could be accomplished, and the supply of cod, &c., not only increased where it is at present found, but, by carrying the

young to new localities, fresh fisheries could be established. One of the benefits derived from this Exhibition, and by no means the least important, should be the collection of such information as would enable the Legislature to act for the public benefit in improving our in-shore fisheries, and induce other Governments to act in concert.

Mr. HENRY SMITH (Brixham) said he had heard it stated during his experience of forty-three years that if their forefathers were wrong, to a certain extent their children were wrong, but he should be able to show that in all cases it was not so, inasmuch as the fishery of Brixham as carried on forty years ago, was a very different thing as compared with that of the present day. Mr. Jex had held up for their inspection a piece of net—a part of a trawl-net which was used at the present time at Brixham; and as a representative of the place, he (Mr. Smith) wished to do all he could to put down the practice of destroying many tons of small fish. Many years ago the smacks employed in trawling were much smaller than those in use at present, ranging from eighteen to twenty tons, but now they ran from forty-five to fifty tons, showing that now they did not work with the same kind of materials as their forefathers did. The trawls now in use were of very considerable length and size in mesh, and would compare favourably in size with those used at any other place. Taking a net of 65 feet for the beam, the mesh was three and a half to four inches in the clear. He had had fifteen years up and down the North Sea fishery, and having seen the trawls used by the fishermen of Hull, Grimsby, Yarmouth, Lowestoft, and Ramsgate, he could safely say that the Brixham trawl would outstrip in size and length that used by any fishermen from any other place. The fishing net which Mr. Jex presented to the audience as a sample of the Brixham

net was by no means the net now in use, nor was it even made in Brixham ; it was merely a "chafing piece," which was used to prevent the chafing of the net, and no doubt it had been obtained from the North Sea fishermen, but it was no part or parcel of a Brixham trawl-net. With regard to the hemp piece of net which had been exhibited, that was only used at the bottom of the trawl in order to keep the fish in when once caught, and the small fish had an opportunity of going through the trawl before they reached that small piece. He denied most positively that the Brixham fishermen were in the habit of destroying the spawn of fish. They had great cause in Brixham to complain of the destruction of immature fish, and at three little places close by, namely, Godrington, Helbury, and Paignton, it was the general custom to use the horse drag-seine, the mesh being so small that everything which came before it was dragged on to the sands, and there left to perish. He had seen thousands of little brill, turbot, and soles left upon the sands to perish. Ten years ago they had trawlers ranging from forty-five to fifty tons, but now a different state of things was coming about, which was destructive in every sense of the word to small fish, as a class of vessels was now being built ranging from fourteen to eighteen tons register, which used the long line, and attached to the side was a trawl, the mesh of which was considerably smaller than any which had been exhibited that morning. If those vessels were allowed continually to shoot their trawls where they now shot them, and to catch the small fish which they now brought to market, they would be doing an incalculable amount of mischief to the fishing industry of Brixham. Scores of baskets of fish were landed, which were not fit for food, and he had lately seen ten baskets of fish landed from a vessel,

the price offered at a public sale being only three and sixpence, notwithstanding that there had lately been a scarcity in the supply. The price given for these ten baskets at once showed that the fish were so small as to be almost unsaleable. If the destruction of immature fish continued, the fishermen in Brixham would starve. His own opinion was that there ought to be a close season for fish.

Captain CURTIS, R.N., said the question for consideration was whether the recuperative power of the fish was equal to the destructive power of the present nets and mode of fishing. He had it on very good authority that in British Columbia herrings spawned on the branches of trees which project into the rivers, and the Indians lived for three months in the year upon the spawn. He should like to know from practical fishermen whether herrings should be allowed a certain time to spawn, during which time it should be illegal for them to be caught, and the spawning beds protected. Another point which had not been touched upon was with respect to the steam trawlers, for it was a moot point with many whether these vessels did not destroy the spawn upon the ground. Herrings spawn on smooth stones and shingle. He was exceedingly sorry that the jurors had not been able to award the special prize for a trawl-net that did not destroy the immature fish, and although he did not like to be personal, he might say he had seen one net which he considered a very good one. He very much regretted to hear that fishermen used a net of thirteen-sixteenths of an inch mesh, and he suggested that there should be a national Fishermen's Congress, at which laws should be tabulated before being submitted to Parliament, so that there might be one universal law, as far as possible, for all nations, beyond the three-mile limit in the North Sea and Atlantic. Laws for

localities by the fishermen of the district and Corporations should be made. The laws which the fishermen required could be made known by the especial representatives of the class.

Captain READ (Deal), who stated that he had had many years' experience as a fisherman, having served his time as an apprentice fifty-three years ago, and lately as an officer of the Coastguard, said that he had been over some thousands of trawlers in his life, and while stationed at Morecambe Bay he had seen some hundreds of tons of immature fish caught by shrimpers, the fish being sold for manure at sixpence a bushel. He should like to see something done to prevent the wholesale destruction of the food of man which was constantly occurring, and he had exhibited a net, for which he had received a diploma and silver medal. The mesh of this net was capable of being changed from a diamond to a square, thus allowing the immature fish to escape.

Mr. GEORGE COWAN (Eyemouth) was very sorry to hear the report that had been given by previous speakers as to the destruction of immature fish. Mr. Jex had stated that formerly the fishermen of Yarmouth had merely to go to the Knowle, a distance of about twenty miles, to catch the fish, but now they had to go a distance of two hundred to three hundred miles, and he should like to know whether he intended to represent that that was because the ground had been cleared up by trawl-fishing. He had been a long-line and drift-net fisherman for over thirty years, and, notwithstanding what had been said upon the subject by Mr. Jex, he had scarcely ever seen a small fish taken by the long line. Many people had an idea that long-line fishing was of no importance, but he could assure them that the markets were chiefly supplied by the long-line

fishermen, some of their boats landing from ten to twenty-five hundredweight of fish every day. At a meeting at Eyemouth some short time ago, a gentleman from Birmingham stated that he had to pay as much as £100 to get fish from Glasgow to Birmingham, but very likely a great portion of the fish had come in the first instance from Ireland. It was a mistake to say that fish spawned only at the bottom, as he had seen a large quantity of eggs which had been found upon some seaweed floating at the top of the water. The practice of destroying immature fish greatly interfered with the fishing in Berwickshire. Herrings were very careful where they deposited their spawn, the usual place being upon a gravelly bottom. His opinion was, that the herring matured in about ten months.

Mr. JOHN HELYER (Great Yarmouth) said that for thirty years he had been engaged in deep-sea fishing in all its branches in all parts of the world; he was master of a trawler for twenty years, and for the last ten years had been admiral of a fleet in the North Sea. During all this time he had seen, from the Jutland Coast to The Hague, some hundreds of thousands of tons of immature fish taken not only by English fishermen, but by those of every nation. There was as much destruction of immature fish by vessels crossing the sea as took place on the shore, and he thought something ought to be done to put a stop to it, though what measures should be adopted he would leave to persons wiser than himself to suggest.

Captain CURTIS asked what was the percentage of immature fish taken by the trawlers as compared with full-sized fish. His object in asking the question was to see whether it would pay fishermen to bring undersized fish ashore in order to sell it as manure, to convert into fish guano.

Mr. HELYER said the percentage was 60 or 70 per cent.

Mr. JEX remarked that he had been informed by one of his captains that he had thrown more immature fish overboard than he had ever sent to market.

Mr. HELYER said his opinion was that trawl-fishing destroyed a large amount of immature fish. If one boat out of a fleet of one hundred and fifty used a small-mesh net and captured a large quantity of fish, the others were bound to do the same, or else the captains would have to go in shore in consequence of their take not being the same. It was not right that this kind of thing should be allowed to go on. If the adoption of a larger mesh would do any good, by all means let it be adopted, but it must be adopted by fishermen of all nations.

Mr. JOHN HEPTON (Grimsby) said, that having been a trawler all his life, he took great interest in all matters relating to the prevention of the destruction of small fish. It had been stated by one speaker that one cod would eat twelve herrings every day ; but his experience, having seen the entrails of many, he might say thousands of, cod-fish taken out, was this, that not more than 20 per cent of the fish caught would be found to contain any herrings whatever, and of those very few would contain more than four or five at the same time, whilst the different stages of digestion showed that they had been swallowed at intervals. The trawl-fisheries suffered exceedingly from the destruction of small fish. When first he went to sea he had no difficulty in returning after having been out for eight or nine days, with from eighty to a hundred boxes of plaice, besides other fish ; but now things were entirely changed, excepting the Fisherbank season, for although the ships were larger they would return after an absence of about a fortnight with only thirty boxes or levels of plaice and half a score of turbot and one or two boxes of soles. The

expense of obtaining a ton of trawl fish was seven times greater than it was fifteen years ago. It was possible to fish some grounds near at home, until it did not pay to fish them any longer, and then it became necessary to go further away, which of course entailed an additional expense upon the owners. He thought the reason some grounds were not so prolific as formerly was, first, in consequence of their being overfished; secondly, because of the destruction of the food of the fishes; and thirdly, through the destruction of the fry. When speaking of spawn, he referred to the eggs, and fry he called small fish. Having given great attention to the subject, he had come to the conclusion that the spawn of haddock and cod floated on the top of the water; the spawn of turbot he had never been able to find. He believed that one cause of the decrease in the number of turbot was the scarcity of male fish, which scarcity had been brought about by catching the fish when they had congregated on the spawning grounds in shoals. Although he had been fishing since last January, he had only seen one male turbot, and he suggested, in order to increase this kind of fish, an attempt should be made to artificially propagate them. He had not been able to definitely ascertain whether the spawn of plaice floated or sank; it was so light in the water that some would sink and some remain on the surface; but if the water was stirred, that which sank would immediately rise to the surface. His own opinion was that it was held in suspense by the motion of the current. The temperature of the water in which the fish spawned was generally about 45°. No doubt soles were the most important of all fishes. Upon the 8th of July he had in his possession a sole which commenced to spawn; each egg was about one-twentieth of an inch in

diameter, and were totally disengaged one from the other, there being no adhesive matter causing them to stick together. Round each egg was to be found a slight ring, and after they had laid still for a short time, they all went to the bottom, and then the ring showed on the top. He had no means of keeping these eggs, or else he should have tried to go further into the matter of how the eggs were hatched. Fish were now so scarce in the North Sea that in order to obtain sufficient to meet the national wants the number of vessels had to be increased, and the expenditure was barely recouped by the increased price obtained for the fish. He had seen hundreds of tons of fish thrown overboard; but it really was not the fault of fishermen; they were not their own masters, and were forced to go where others went, if a large haul could be obtained. The average weight of an ordinary-sized plaice was three and a-half pounds, and the quantity of small fish that were and are still caught on the German coast during the summer that it took to weigh three and a-half pounds was seventeen. He had seen large quantities of fish thrown overboard, which he considered a great waste of human food, as it was well known that when fish had been brought up in a trawl it was impossible for them to live when thrown back, in consequence of the handling which they received. With regard to the small fish caught around the coast, he could not say much, as he had never been in a shrimper, though he recollected, when a boy, having seen as many small plaice, flounders and brill destroyed as would fill a large basket. He did not wish to interfere with any class of fishermen, but he thought it ought to be made compulsory upon all shrimp fishermen to throw overboard what was of no benefit to them, or to any one else, at that time, because they might be of benefit to

the country at large when they arrived at maturity. With regard to what had been said about fishermen not being able to get a living in consequence of the scarcity of fish, he might say that he could not agree with that, because when fish got scarce the price went up, and it would pay a fisherman just as well if he got sixpence for one fish, as it would if he got sixpence for three. No doubt the question was one which affected poor people, as they were now only able to get for one-and-sixpence what at one time they obtained for sixpence. He had known £15 paid for a box of soles ; this large price was caused by the use by fishermen of a small-mesh net. The sole was usually found in the southernmost parts of the North Sea. The subject of nets was one which demanded the consideration of an International Conference, because the nets in use in the United Kingdom would bear no comparison with those in use by the fishermen of Belgium and France, which were of so small a mesh that he could not put his finger through it at the cod end. When the trawl was at the bottom of the sea the fish went underneath the square before they got into it, and if the mesh was large enough they would certainly swim out, especially the sole ; but, if it was not of course it was impossible for a small fish to get out. As one gentleman had asked whether fish recuperated as fast as it was caught, he might say that at one time he firmly believed that all kinds of fish were able to reproduce in about five years, but he thought it was impossible to come to any satisfactory conclusion unless you had the fish under your own eyes from the time they were in the egg until the time they were able to reproduce themselves. If plaice had sufficient recuperative power they would not diminish so quickly as they now did. He considered that a plaice would not get to full size under six or seven years.

Soles would spawn in any part of the sea, and he had found both small and large soles at all places, though he never found a small plaice in the open sea. All round the English coast a small fish, excepting soles and haddocks, would never be found outside a distance of three or four miles—they were always found close in-shore, and from that he argued that sea fish did not come in-shore to spawn, but that there was some provision of Nature whereby the small fish were carried from the place where the fish spawned until it arrived upon ground suitable for it to exist. If the small fish were not caught on these grounds they would stay there just so long as the food was suitable for them, and it was well known that food suitable for a small fish was not suitable for a large one, and consequently as soon as they arrived at a certain age their instinct caused them to remove to another part where they found that subsistence which was suitable for them. After they had grown to the proper size when they were able to reproduce, the same instinct which guided salmon to go up the rivers to spawn guided them to the spawning grounds. If it could be satisfactorily proved that soles, turbot, haddocks, or cod, deposit or shed their spawn upon particular grounds, and this can be done, they should have time allowed them during which they might deposit their spawn, and he should be in favour of a close time being enforced on those particular grounds for a certain time, though he did not by any means wish to put a close time on fishing during the spawning season, as there were plenty of other grounds where the fishermen might go to during such times.

If time had permitted he had purposed to say a few words as to any improvement or regulations that might, under the circumstances, appear advisable, and if it is

thought that anything beneficial could be done, why should Great Britain wait for the co-operation of other countries? Our trawl-fisheries exceed those of any two bordering the North Sea for effectiveness, and consequently our benefits would be greater even if other countries reaped some slight advantage through our self-denial.

The Conference then adjourned for luncheon.

The Conference was resumed at two o'clock.

Mr. SALMON (Grimsby) quite agreed with Mr. Jex that every trawl carried by a deep sea fishing-boat should be limited in size. There were a great many which were under the scale, and the consequence was that they caught a great quantity of immature fish which was entirely destroyed. Yesterday, for the first time in his life, he took the exact measure of the mesh of his trawl. There were five different scales; the first was 3 inches, the second $2\frac{3}{4}$, the third $2\frac{1}{2}$, the fourth 2, and the last $1\frac{3}{4}$, and he thought such a scale of mesh would allow any unsaleable sole to escape, and that they had done all that could be expected in Grimsby to stop the catching of immature fish. But he thought it was utterly impossible to stop it altogether, because in the passage of the trawl over the ground, no matter what came in the way it was bound to catch it, and the speed the vessel carried the net over the ground, at the rate of $1\frac{1}{2}$ miles an hour, caused the meshes to be drawn so tightly that it was impossible for the small fish to escape, and even if they did escape after they had been a certain

time in the trawl, he did not think they would live to come to maturity. He had known several fishing-grounds where, when you caught the fish and held them up, you could see through them like sheets of paper, but the next season they found the fish were a little better, and so on ; and he came to the conclusion that the continual trawling and ploughing up of the ground caused worms and small shell-fish to come to the surface, so as to afford more food to the fish, and that, therefore, some good was produced as well as evil. He had no doubt they were all aware that nature had provided different places of protection for animals on shore, and likewise similar places of resort for fish at the bottom of the sea. These were places where sailing vessels could not fish on account of the rough ground-rocks and stocks ; but it was found from experience that on different parts of this rough ground there were portions of what was called fine ground, and the steam trawlers, which were constantly working up and down the coast, found out where these grounds were by means of their lead, and were able to work them, and thus caught the fish in this protected place amongst the rough ground, and thus prevented the fish getting out farther away where the sailing vessels could get at them. It was now necessary to go a great many miles to sea ; the expense incurred in fitting out the vessels was very great, and at times the returns were not enough to make it pay. In former times the vessels were very small, but now, as trade and demand had increased, they had increased in size, and of course in cost ; but it not unfrequently happened that an accident would occur by which the whole of the gear was carried away, to the great loss of the owners and fishermen.

Mr. COWAN wished to add, that at the conference of fishermen at Eyemouth the opinion was expressed that

line-fishing had a good effect, and increased the quantity of fish instead of diminishing them.

Mr. WELFARE (Worthing) said most of what he intended to say had already been said before. He had had thirty-five years' experience, and he had known the time when there was abundance of fish in Rye Bay, and other bays on the coast, but it was not so now, and it was well known that the real cause was the wholesale destruction of the young fry; you might often see soles not an inch in length, and turbot about as big as a whiting. During the last eight or ten years a great many more fish had been brought in and destroyed or used for manure, than were fit for food. In 1878, when he gave evidence before the Commission, on which the late Mr. Buckland and Mr. Spencer Walpole sat, he laid down what he thought would be suitable sizes for all fish to be brought into the market, and he thought if legislation followed those lines the supply might be increased four-fold. If he had the power of a despot, he would do what the late Emperor Napoleon did with regard to the oyster. In 1862 England imported oysters to France, but later on, through the discretion of the Emperor Napoleon in preserving oysters, the tables were turned, and we were now almost depending on France for our supply. Fish spawned at different seasons according to the kind and locality. In the West of England the spawning began earliest, and protection for the young fry was required the same as for the produce of the land. He would not say much about theory, but he considered the present state of the fisheries was entirely due to theorists. Professor Huxley made the remark at Norwich that he would allow fishermen to fish when, where, how, and as they liked. It appeared to him that a steward might as well tell a nobleman when the first fruits of the estate

became ripe, to let in the whole rabble of the town to come in and take the produce at their discretion. He hoped this would not be the last Conference held on the subject, but that it would be adjourned to a more convenient time. They were all agreed that a wholesale destruction was going on all round the coast, especially on the south coast, and he could sometimes shed tears of vexation to see the little fish brought in. The Crab and Lobster Bill was almost a dead letter, and in 1861 he sent to the Home Office a crab weighing one-and-a-half ounces, which was the largest he could select out of about ten bushels. The law forbade the offering of these fish for sale under a certain size, but there was nothing to prevent the men catching them and eating them themselves, or giving them away, which seemed to him a great mistake. The Act had been in operation since 1877, and had done no good at all.

Mr. JEX asked Mr. Welfare whether seine-nets were worked on the south coast.

Mr. WELFARE said yes. In 1866 he was a witness to about ten thousand mackerel being brought in, out of which only eight hundred were large enough for sale.

Mr. J. C. BLOOMFIELD wished to say a few words in behalf of the Irish fisheries. He had never been so delighted in his life as to hear a number of practical fishermen discussing in such a masterly manner the interests with which they were connected. He would impress upon them that the question of international law was one of great difficulty; they would never get a Frenchman to alter the mesh of his net, or to do anything whatever in the interests of the English fisherman; whatever he did would be done in his own interest, and his interest would be according to the party who happened to be in power at the time. If

Mr. Birkbeck, with all his energy and ability, endeavoured to carry out the international system, it would be the hardest task he ever undertook. Every now and then the shifting of responsibility in the Cabinet of France would upset the scheme altogether. He therefore begged them to stand by each other, and with the independence of Britishers endeavour to carry out some regulations for their own benefit. He found on one point a great deal of ignorance manifested by most of the speakers, and that ignorance was not confined to them, but was shared by the Chairman and many others, and that was with reference to poor Ireland. Mr. Jex had shown that, owing to various circumstances, they were driven far out of the grounds they had formerly fished, and they had been obliged to expend more money, and to go three hundred or four hundred miles off; they did not seem to be aware that within a very short distance—only eighteen hours from the London market—there were over two thousand miles of coast unfished, but that was the fact, as he had proved in the Paper read at these conferences, from official documentary evidence. What was required to improve this industry was, first of all, harbour accommodation, and next, proper means of transit, so that when the fish were caught they might go to the nearest point, and be conveyed to market at once.

The CHAIRMAN reminded Mr. Bloomfield that the subject he was now touching upon would be discussed later.

Mr. BLOOMFIELD said he was not aware that the discussion was confined to the destruction of immature fish, but on that subject he could only say that the Irish were entirely innocent, because for want of a market, transit, and means, the quantity caught was infinitesimal compared

with the existing supplies, in vain presented by a kind Providence.

Mr. JAMES ALWARD (Grimsby) hoped this meeting would not be the last one on the subject, but that out of it would come a conference of practical fishermen, and that arrangements would be made such as would enable more of them to attend. London was a long way from most of the fishing ports, and many people were not able to come who were interested in the matter. He heartily concurred in what had been said by the last speaker with regard to the Irish coast, where he believed fish abounded; but the gentleman who spoke before him gave an illustration which was not quite applicable to the case. He spoke of a man having a quantity of fruit and vegetables, and allowing the people at large to come in and destroy it, but they happened to know all about the physical causes that governed the fruit, vegetables, and other products of the land, but unfortunately they were in a state of gross ignorance with reference to the sea. He had studied the question himself a very long time, and had just reached the point of being aware of his own ignorance, and also that there was a great amount of ignorance on the part of others. He should have no difficulty, if time allowed, in entirely flooring many of the arguments which had been put forward that day. An instance had been given of a large quantity of mackerel being caught with a seine-net, out of which there was only a certain number fit for market. But how was a difficulty of that kind to be regulated? If the fish abounded on the coast, and a man went out with his net, and took a quantity, how could you prevent the small fish being taken.

Mr. WELFARE. By making the mesh of larger size.

Mr. ALWARD said the gentleman who spoke before had

shown that when the meshes were tight the net would take fish you did not want to take. You might impose what restrictions you liked on the net, but when there was a certain strain upon it, though theoretically a given size mesh would allow any size fish to escape, practically it was not so. You could not allow a shoal of large fish to escape because there was a danger of taking some small ones. If that line of action were adopted no very large fish would be taken. He listened with great pleasure to the opening address by Mr. Jex, at Norwich, and also to the one delivered by Professor Huxley, in which he made the statement which had been referred to, that he would allow fishermen to fish as when, how, and where they liked ; and he would advise all his friends to hold their judgment in suspense on that matter, because it was not at that conference that they would get at the real state of the case. After all, it might turn out that Professor Huxley was correct in his conclusions ; but there was not sufficient time to enlarge upon the matter, and to show how it might be so. One gentleman spoke about steam trawlers, others against trawling altogether, others about line-fishing and drift-net fishing, but in all these investigations it would be found that the various classes of fishermen abused the means used for the capture of fish by other classes, and this consideration must have its due weight. He admitted the public generally were not actuated by ideas of that kind. To them it was a broad question, could anything be done to maintain and preserve the bountiful supply of fish which was so valuable as an article of food? But a right conclusion could only be arrived at by getting the scientific man with his knowledge of natural history and other sciences, and the practical fisherman, and putting the views of one against the other, and having the thing

reasoned out deliberately. Many of the propositions put forward that day, although they appeared very plausible, when they came to be thoroughly examined had no practical weight whatever. It gave him very great pleasure to notice the careful manner in which Mr. Hepton, a practical fisherman, was studying this question ; and there was great evidence that whatever fishermen had been in the past, they were now progressing, and that with the spread of education and love of reading there would in the future be people connected with the fisheries who would be able to grapple with this great question. The various modes of net-fishing which had been condemned by different classes of fishermen only differed in degree ; the only real difference was in line-fishing, where the fish could not be said to be captured, but took the bait of their own accord. He was pleased to hear the testimony from a Scotch gentleman, which went a long way to refute what had been advanced at a commission of inquiry which had taken place of late in Scotland, that the operation of trawling had entirely destroyed the fish on the Scotch coast, for if he understood him aright, he said the fish had been very plentiful indeed. The other question with regard to immature fish was, were fish sufficiently prolific to increase and keep up their numbers regardless of the means of capturing them ? If it was true that they did produce in such numbers as to be almost incalculable, then the modes of fishing would have very small effect. Four or five years ago there was a commission of inquiry at which he gave evidence, and he still adhered to the views he then expressed, namely, that notwithstanding what he might think about trawling not being sufficient to exhaust the fisheries of the North Sea, he was still willing to admit that if scientific men could prove that certain grounds were breeding grounds or nursery grounds, the Government

should step in for the purpose of regulating to some extent the fishing on those grounds. That was as far as he would go in that direction. He had knowledge of the fisheries from the West of England right round the coast of Scotland, and his experience only showed him how careful they must be in accepting positive statements without due inquiry. A gentleman from Brixham had told them of the kind of trawl he used, which he said was larger than any other. No doubt he made the statement in good faith, but he (Mr. Alward) had the management of a trawl which he was sure would astonish that gentleman if he told him the magnitude and extent of it. He had spoken of fishing vessels ranging in former times from 18 to 25 tons, and now-a-days from 45 to 50 tons. To-day they were using vessels from 45 up to 130 tons. Again there was a generally held opinion amongst practical fishermen that the places where the small fish were obtained in such large quantities were confined to the coast line, and that was true to a large extent, but not absolutely true. In the line somewhere between the Texel and Boston Deep, there was a place where a large quantity of small fish were caught in the middle of the North Sea. The Grimsby people did not fish there very much at present, though they did formerly; but an immense quantity of small plaice were found there, and as far as he knew that was the only exception to the rule he had referred to. Coming to the size of mesh, a mesh which would allow small plaice to escape would allow the largest sole they knew anything about to pass. When the Silver Pits abounded with soles, small soles were caught there in immense numbers, but that was a thing of the past, for hardly any soles were caught there now. He had not been able to satisfy his mind whether the exhaustion of the

fish on the various grounds was due to overfishing or to natural causes, or, at least, if they were artificial causes, whether they were not something apart from trawling. It was somewhat remarkable, that though turbot was stated to be one of the most prolific of fish, it was one of the scarcest; yet there had been instances within his recollection of turbot abounding in immense quantities in the vicinity of Falls Banks and New Ground Bank, and the vessels which were there to catch them were insignificant in number, and the gear they used would be looked upon almost as a shrimp-net as compared to a trawl. Mr. Jex had referred to laws being enacted in the reign of Edward III. to protect small fish, when the statement was made that but for this protection the fish in the North Sea would have been exterminated. It was also said that it would take longer to obtain a given quantity of fish now than formerly, but that was not exactly correct. Fishermen were not accustomed to reason very closely, they were the most ready to come to hasty conclusions of any men he knew anything about, and did so simply because they had not the same varied experience as men whose associations were on land, and who were engaged in different commercial transactions. He would ask any practical fisherman what was the nature of the appliances for hoisting fish out of the water on to the vessel's deck. It consisted of certain tackle and numbers of sheaves, a certain sized rope, and a certain mechanical contrivance to heave it in; but what had they thirty-five or forty years ago? If you asked the North Sea fisherman to-day to go to sea with the sort of tackle he had thirty years ago for hoisting the fish in, he would say it was no use going to sea with such apparatus, that he would catch more fish than he could lift out of the water with it.

There were recent instances of more fish being caught in a given time than was ever known before. He did not wish to say a word against the knowledge and ability shown by Mr. Jex, which no one appreciated more than he did, but he did not want the public to get into a state of excitement and be carried away by false issues. Whenever an opportunity was given for Mr. Jex to hold a Conference, if it were an international one he should have the opportunity of coming to it ; but many people could not do so, and therefore he hoped local arrangements would be made at the various ports whereby those possessing knowledge of the subject could come together ; so that with the assistance of scientific and practical men a right conclusion would be arrived at. It would not do to hurry Government into legislation. An Act had recently been passed called the Fishing-boats Act, which had been the result of careful deliberation ; but perhaps Government had not as much knowledge on the subject as it might have had, and, though it was done with the best intentions, it was not satisfactory. They should, therefore, be careful not to press the Government to do something which they might have to regret afterwards. He believed that he could prove to demonstration that it was a question of displacement, not destruction. No doubt many of the fish they used to catch near the shore were now caught farther off, but they did not know that when they are found nearer the shore they were also found at greater distances, and it was pretty well settled that fish were of a migratory nature.

Mr. JEX asked if Mr. Wilmot could give any information with reference to the capture of spawn, fry, or immature fish on the coast of Canada ?

Mr. WILMOT said he thought it would be out of place for him to interfere in the present discussion, which was confined

to British fisheries, though, if time permitted afterwards, he should be glad to say a few words. He would only say that if they waited to lock the stable-door until the horse was stolen it would be too late.

Mr. HELYER said Mr. Alward was quite right in advising them not to come to any conclusion until they had thoroughly considered the matter, but, from what had been said, he thought it was quite necessary that something should be done to stop this total destruction. He did not think they could do better than leave it in the hands of the Chairman, who had already shown his energy with regard to the important question of lights on vessels, and persisted in his representations to the Board of Trade until something was done. He begged to move the following resolution: "That taking into consideration that the question of the destruction of immature fish is one of international importance, it is in the opinion of this meeting imperative in the public interest that an international Conference be held to consider the desirability of recommending legislation upon the subject; and this meeting of practical fishermen further requests of Her Majesty's Government to take immediate steps to bring about such Conference at the earliest possible date."

Mr. SMITH (Brixham) seconded the resolution.

Mr. SIMS (Hull) supported the resolution. As a fisherman of thirty years' standing, and having had experience of the fisheries from the Land's End to John o' Groat's, he studied this question for a very long time, and had reviewed it very carefully. In Mount's Bay they used to catch an abundance of soles in April and May, ten to fourteen inches in length, very few under, but they had all disappeared, or nearly so, the reason in his opinion being the small nets used in-shore which caught all the small fish before they

came to maturity. Taking the coast from Land's End to Horn Reef, there was what might be called an in-ground and an off-ground ; the in-ground would run from six to seven or eight fathoms, and beyond that, particularly in the North Sea, you came to rough ground. There large soles were caught, and he believed they went there to deposit the spawn. In the summer season the young fish could be almost dipped up in shore, but directly the snow touched the water, out they came and resorted to the rough ground. A friend of his said that it took eight years for a plaice to be full grown, but he could not agree with that. Take the hake, for instance. In the month of May they were caught in Plymouth Bay about an inch and a-half or two inches long, but from May to Christmas they got larger and larger, until they weighed a couple of stone, and he had known them fifty-six pounds ; in fact, you could almost see them grow, and if these fish came to maturity so quickly, he could not conceive that plaice would take eight years. With regard to the question of tackle, it was quite true that in former times the vessels were not so large as they were now, but the tackle was quite capable of lifting as much as it was now. He had helped to heave in one hundred dozen of hake in one bag with one of those tackles ; they had then a runner on the tackle, which gave not only a double purchase, but a three-fold purchase, now it was only two double blocks. Vessels were now three times as large as they were, and more. They had some from Hull 180 tons, but they were steamers, the net tonnage being 98 to 120. They had sailing trawlers from 86 to 90 tons, and he had just launched one which he called after the worthy Chairman, the "E. Birkbeck," of 87 tons. The destruction of immature fish certainly wanted consideration ; it was no use to let the horse go before they shut the door. It was quite true,

as Mr. Alward said, that thirty years ago there were small soles in the Silver Pits, but there were a great many large ones. Where you got one pair of large soles, you would get fifty then. He believed at this day there were more soles caught in number than there were fifty years ago, but, on the other hand, not one-tenth as much in weight. Why was this? Because all round the coast you found horses and donkeys drawing trawls up and down the beach, and the little soles and plaice might be seen left to dry on the beach. If that was not destruction, he did not know what was; and unless something were done to stop it, the sole would be almost a thing of the past. Not that he thought they were going to exhaust the sea, they never could do it, because there was a grand command, "Be fruitful and multiply, and bring forth abundantly;" and out of the whole creation the fish was the only thing that was commanded to fill the waters of the sea, and they were full. (Loud applause.)

Mr. J. W. ARNOLD (of Kingsdown, near Deal) said something like forty-five years ago he started fishing, first with the shrimp-net, then for sprats, then for herrings, and afterwards mackerel. At certain seasons of the year, in going along the beach, you came to small transparent purses sticking out of the sand at low water, generally close to what was called honeycomb rock, and those when examined would be found to be full of small soles, and others turbot, brill, and all that kind of fish, except skate or wray, which were found in four-square purses. All this young fry should be protected, for this must begin at their own doors. The moment the herring and sprats came out of the eggs they were able to take care of themselves. In his belief, the donkey-trawl was the greatest destroyer, much more so than the deep-sea trawl, which he did not

believe did half the mischief that was supposed. Trawlers generally avoided spawning ground when they knew it. One of the greatest places for spawning was the estuary of the Thames. Herrings spawned about November. He had been hauling seven lasts of herrings in the Downs at one haul in twenty-five nets, and the remainder had broken away with the fish and were lost. Those fish were all in a spawning state. He had known them in that state all the winter afterwards, and they were rolled up in great quantities along the beach after heavy winds. His belief was that these fish went from one place to another until they found a favourable place for spawning. Sprats and whiting spawned in the months of April and May, and on a fine day you could sit upon the beach from Gravesend round to Dungeness and find them in incredible numbers. He had no doubt the warmth of the water round the shore at that season of the year attracted them ; and he also believed that shell-fish who spawned before that time afforded them food. Afterwards, when the oyster began to eject its spawn, the mackerel played great havoc with it, but they would also take small fish, sprats, or anything that came to hand that was not quite as large as themselves. The mackerel was said to come from the westward. But what brought them ? He believed they followed the water of a certain temperature up the channel, and as they came up they selected those places where they could find food. All shell-fish spawn came to the surface when first ejected, and as it gained weight it sank to the bottom. It was useless for one fisherman to use a trawl with a large mesh unless all did the same ; but he believed they had a great deal in their own hands, and he thought it would be a good thing if such people as the heads of the Exhibition, or his Royal Highness the Prince of Wales, who had a

great deal of influence in foreign countries, would issue a suggestion to all fishermen, that the moment the shrimp-net came out of the water the first thing to look after was to throw the young fry overboard. The mackerel, he believed, only spawned about the latter end of June and the beginning of July. The spawn lay for some time at the sea-bottom, then the young fry came forth, and were in an oily state in the month of September, and the next spring they were fit to be caught.

Mr. THOMAS KEMP (Whitstable) said he was perfectly acquainted with the estuary of the Thames from the North Foreland up to the Naze, Harwich, where the chief trawling was done by the shrimp-net. Some thirty years since it was very prolific of edible fish, large quantities of which were caught and taken to market, but from some cause they had disappeared, and those now taken were chiefly taken by shrimp-trawls. If it were to be the law that trawl-nets should be of a certain size, it would be impossible to catch the shrimp. If you saved the shrimp you must save the small fry. One speaker had said that when small fry had been in the net a certain time they would be useless if cast into the water again, but he could hardly believe that that was so. There was a great demand for this small fry for the purpose of bait, especially all along the Kentish coast, and at Grimsby, where what was called trotting for whelks was pursued, and the small fry was saved by the fishermen, and saved for this purpose. If anything could be done in the shape of legislation to prevent this, it would be of great benefit. He believed as many whelks were destroyed and cast into the water again as actually came to the market.

Mr. WOODGER (Scarborough) said he was not a fisherman, but he felt bound to say a word in support of the

resolution ; he could only speak of the Yorkshire coast, but he considered the catching of immature fish was a matter of vital importance. It did not affect the fishermen quite so much as some seemed to think, because as fish got scarcer it got dearer. He had seen a vessel go to sea for a night's work, and catch six or seven boxes of big haddock in the summer, and as many as forty boxes of little fish. He had sold those fish, and sometimes had a difficulty in getting 6*d.* a trunk, sometimes 9*d.* and 1*s.* ; but hardly ever more than 3*s.*, whilst the average price would be 1*s.* 6*d.* If these small fish were allowed to come to maturity one box would be worth ten, and instead of being sold for 1*s.* 6*d.*, would fetch 8*s.* or 9*s.* He did not think anything could be done to stop the universal catching of small fish, but if the recommendation of the Commission which had been sitting in Scotland of the three-mile limit were carried into effect, it would save a great deal.

Mr. HERBERT HOUNSELL (Bridport) said he had hitherto refrained from speaking on this question, because he had been listening to the practical observations made by fishermen from different parts of the coast, which were of great value. Although what he might say was not equal in importance to what had already been said, he would add a few words which he thought were worthy of attention. He had been much interested in this matter from his youth, and had often conversed with the late Mr. Buckland upon it. In *Land and Water* for the 30th of April, 1870, there was a letter from Mr. Buckland with regard to the collection of fish in his museum at the Horticultural Gardens, and it included a letter from himself, in which he offered to furnish him with specimens of the different kinds of lines and nets used in the capture of fish. His offer was accepted, and he presented

him with £120 to £130 worth of fishing-nets, which were hung up in the South Kensington Museum, where they had gradually rotted away, but the lines remained. Mr. Buckland was much struck with the idea that the small mesh of the trawls must destroy large quantities of fish, and he said he hoped visitors would examine the nets with particular attention, as it would show the necessity for legislation on the subject. Not only was there no room for the young fry to escape, but they all got jammed in a semi-solid mass at the lower end, and of course were destroyed. The most practical idea he had seen was a large square mesh two inches from knot to knot. When the quantity of seaweed and pebbles which got collected in the end was taken into consideration, he thought there was not much chance of any sole escaping; but if a few small fish did escape so much the better. There had been times when smaller meshes had been used for driving. He could remember the time when the Dutchmen used nothing smaller than $27\frac{1}{2}$ meshes to the yard; they then got to 30, and the same thing had happened with herring-nets. A drift-net had the advantage that it would not kill fish which it was not intended to catch; if there were large fish in the water they would not mesh, nor would the small, they escaped, and were caught another day. He believed one of the most feasible ways of dealing with this matter, would be to enact that the whole of the foreshore within three miles should be preserved for trawling, thereby the spawning beds would not be disturbed, and the smaller fish would also be left at rest; the small mesh should also be done away with, except on particular grounds where it was used for sprats, whitebait, and fish of that description, and, as much as possible, gill-nets should be adopted within three

miles of the shore. The gill-net was the first kind of net which could be used, especially on waters where the fish spawned. If it was set to catch cod, you could not catch sprats with it ; and if you were fishing for large herring, you would not catch a pilchard. He believed this Exhibition had been the means of drawing the attention of the public to a matter which thirteen or fourteen years ago a few isolated individuals were attending to, and it was a great point gained that the attention of practical fishermen should be directed to the matter, and especially to the preservation of spawn and young fry. The Jockey Club was a society formed for preserving the best interests of race-horses, and he did not see why an analogous society should not be formed to watch over the interests of fisheries. In Canada and the United States there was a Minister of Fisheries, and he hoped the time would come when there would be something similar in this country, so that through a practical investigation of the habits of fish, proper means might be devised to prevent the destruction which was now going on.

Mr. JEX then referred briefly to the remarks which had been made by previous speakers, in the course of which he said that the pont-herring which used to come in large quantities to London, being caught along the Blackwater and right down the Essex coast, across to Boston Deep, and even up the River Humber, had entirely disappeared. He also condemned the catching of whitebait, which was nothing but the young fry of sprat and herring. Legislation had done a great deal for the crab and oyster fishery, and why should not the protection of other deep-sea fisheries be taken in hand ? He did not advocate a close time for fishing, but thought if the size of mesh were restricted that would answer the purpose. It had been

said by some gentlemen that, even if the meshes were larger, the drawing of the net would prevent the escape of small fish ; if that were so, what was the object in having the mesh so small, and why should there be any objection to having a larger one ? But the fact was, that in drawing in the net, owing to the motion of the sea, it was slackened from time to time, which would allow of an immature fish to escape. He had been very much pleased with the suggestion of Mr. Alward, that Conferences should be held all round the coast, at which men of practical knowledge could be got to take part, and he should only be too proud to attend such meetings.

The CHAIRMAN said no doubt the resolution would be passed, and it would be the duty of the Executive Committee to forward it to the proper authorities, but at the same time he would point out that they all knew well enough what was thought of a resolution in the House of Commons : a resolution might be passed, and not the slightest notice taken of it. Notably he could say that a resolution was passed last session which affected himself in an agricultural point of view, but nothing came of it. If this question came before the House of Commons, and any members were fortunate enough to secure a night when the discussion could take place, and a resolution was carried, there was no proof that whatever Government might be in office, any action would be taken in consequence ; but this point was beyond all doubt, that if the Government made up its mind to take any action in this matter, it would be only common justice to the fishermen throughout the United Kingdom that there should be a most searching inquiry into the whole matter first, and they must not encourage any Government to take a leap in the dark, and legislate in any particular direction without a most careful inquiry. Un-

fortunately, there had been legislation carried out without inquiry, and afterwards fishermen had had to complain of it. He alluded especially to the Fishing Vessels' Lights Act. This matter was undoubtedly one of the greatest possible difficulties, and what had been said to-day would have due weight, because the discussion would be published in the official documents, and would be read in every part of the world. Before anything was done, however, a Royal Commission would have to be sanctioned, and no doubt it would take, as in the case of 1866, some two years to investigate the matter. Then the next step would be to endeavour to persuade foreign Governments to take part in it also, and that would be an exceedingly difficult thing. He for one could not hold out any hope that at present foreign Governments would assist, though possibly he might be wrong. Another point to be borne in mind was this, that if an international convention were agreed to there would be this difficulty in carrying it out, namely, of having a sufficient number of gun-boats to enforce the regulations which were made. There were many other matters he should be glad to touch upon, but time did not allow going into them.

The resolution was then put and carried unanimously.

The CHAIRMAN announced that the first subject to be taken into consideration the following morning would be the Railway Rates.

CONFERENCE ON SATURDAY, OCT. 27, 1883.

E. BIRKBECK, Esq., M.P., in the Chair.

RAILWAY RATES.

The CHAIRMAN, in opening the proceedings, said he believed they would to-day be honoured with the presence of his Royal Highness the Duke of Edinburgh. (Loud applause.) As he intimated yesterday, the question under discussion to-day would be that of Railway Rates. It was a subject which in his opinion was easy and simple compared with what was discussed yesterday—was a very delicate and complex question, and he was sure it was one that not only the fishermen throughout the length and breadth of the United Kingdom were concerned in, but also the community at large. He had constantly heard it remarked by fishermen that it was no use their sending fish to London and other large towns because of the excessive rates which they would have to pay for carriage. He had seen the sale-notes of fishermen at Billingsgate, and had been astounded to see how in many cases what ought to have gone to the fishermen in respect of the fair return for the fish sent, had been completely swallowed up by the rates which had been deducted for carriage. He believed there were gentlemen present who would state that not only had it occurred constantly that there had been no return whatever, but that on the other hand there had been a balance

to pay on the part of the fishermen on account of the rates. It would be apparent to those present, and the community at large that there must be some remedy for this, and that they ought to ask the railway companies for fair play and justice in the matter. As he had said before, it was not a question alone for the fishermen, but one which concerned the community at large. If the supply of fish was to be increased for London and other populous towns, then they ought to ask the railways to meet the fishing interest in a fair and proper way. He trusted there were representatives of some of the railway companies present to-day, but if they were not then present he hoped they would come during the course of the day, so that they might give their version of the question, and answer any facts that might be brought before the Conference. He had no doubt they would probably say that they could not be expected to convey fish from various towns upon the sea coast by express and mail trains at the low rates the fishermen asked for, but of course that was really a question of policy. He should imagine that if the railway companies would take it into their consideration to reduce their rates to what the fishing interest asked for, the result would be an enormous increase to their funds. He was sure it would be a benefit to the railway companies in the end if they would take it into consideration and would meet the fishing interest in a fair and reasonable way. He then called upon Mr. James Alward, of Grimsby, as a practical fisherman of long standing, to open the discussion.

Mr. JAMES ALWARD said his *forte* was more to listen than to speak, but, as the question was an important one, he might be permitted to make a few observations. As the question was a purely commercial one, it was a little bit unreasonable to expect fishermen to possess the neces-

sary ability to deal with the subject in the way in which it should be dealt with. Having had large experience of the way in which the fishing trade had been developed, he might say that he considered they owed their present position to the railway companies for having afforded them the means of distributing the fish throughout the country. That being so, it was of the most vital importance that the companies should do all they could to meet the growing necessities of the case by giving additional accommodation. When large quantities of fish could not be sent to different towns in which it might be consumed, in consequence of the high railway charges, it was apparent that it became a most serious question, as it affected the food of the masses. When the question of the destruction of immature fish was before the Conference, one gentleman stated that boxes of fish containing from five to six stone were sold at the ports at which they were delivered for 6*d.* and 1*s.*, and as a natural consequence people were inquiring why they could not get fish at a price less than was now charged for it. At present large quantities of fish were consumed at the ports at which it was landed, and some was sold for manure ; but if railway accommodation was easy, it might be sent to London to form the food of the poorer classes. Railway companies might think that they had the case in their own hands, and could charge what rates they liked. They might say that fish was a perishable commodity, and that as there was nobody to press upon them the reduction of the rates, they could keep up the monopoly. If that was their argument, all he could say was that it was not by keeping up excessive rates that people brought the greatest benefit to themselves. There could be no greater instance of that than the penny postage, which had demonstrated the fact that popular rates in-

creased the income of those interested in the subject. Speaking as a practical fisherman, he should be happy to do his mite in the matter, in order to bring pressure to bear upon the railway companies, and to try and show them that this was a question which could no longer be disregarded. It might be said that they could bring fish by water, but that mode of conveyance was scarcely worth mentioning, and to many places fish could not be sent by water, so that the railways had nothing to fear from competition. The Grimsby Smack Owners' Association had tried over and over again to bring pressure to bear upon the railway companies, but up to the present time they had not succeeded in lowering the rates, although the railway companies had at different times offered some little compromise, but the concessions made had not been adequate to the requirements of the case. He hoped that a resolution would be passed by that meeting, and forwarded to the proper quarters, which would have the effect of arousing public feeling upon the matter, so that attention might be drawn to the subject.

Mr. JEX said he also was a practical fisherman, and a member of the Fish Trade Association of London, having been appointed delegate for England, Ireland and Scotland to appear before the Railway Commissioners upon the subject of railway charges. He had received a great many communications upon the subject of railway charges, which, with the permission of the meeting, he would refer to. The first letter was from Mr. Thompson, of Leith, who stated that the railway carried vegetables at 25s. per ton. If sprats were carried at the owner's risk, the rate was 55s. per ton, and if at the company's risk, 73s. 4d. per ton, the value of the sprats being about £9. Potatoes were carried in four-ton lots in a truck at 25s. per ton, or £5 share of

truck at company's full risk, and fish at £11, but £14 13s. 4d was charged if the company were responsible. Railway companies knew that fish must be carried by them, or cured and sent by sea, and in their dealings with the fish trade they were insolent, arrogant, and impudent.

Mr. STEVENSON remarked that the fish had to be sent express to London, and that no delay was permissible; if it was delivered at Billingsgate at three or four o'clock in the afternoon, from circumstances over which the railway companies had no control, the value of the fish was gone, so that it would be a near-sighted policy to propose that fish should be carried at a farthing per pound, and have it subject to delay.

Mr. JEX then read another letter which he had received from a gentleman, stating that the rates for fish by goods trains were 2s. 9d. per hundredweight, the railway company not being responsible for any damage. The letter went on to state that railways were constructed with a view to facilitate the trade of the country, but, instead of doing so, they were doing all in their power to impede it. Some people might call them gigantic monopolies, but, in his opinion that was to mild a term—that a cask of herrings could be carried from Glasgow to Cork for 2s. 5d., but if it was sent to London by goods train it would cost 7s. 4d. The North British Railway or the Caledonian Railway would send a waggon with one horse from Leith to Midcalder for 3s., and for one barrel of fish weighing two cwt. they charge 2s. 3d. Another letter was from Mr. Matthias Dunn, of Mevagissey, to the effect that the rate for fresh fish from that place to Billingsgate was £5 per ton, for which sum goods could be forwarded to Australia and sent back again, and then leave a surplus. The writer expressed an opinion that the facilities offered

by the French railway companies gave the French fishermen considerable advantages over the English fishermen. He had also received a letter from Mr. Vaughan, of Yarmouth, who had been in the fish trade all his life. That gentleman stated that the rate for sending offal to London was 26s. to 28s., prime 37s. 6d.; but this sum did not include iceing, for which a charge of 3d. per package was made, bringing the amount to 5s. per ton more, nor did it include collecting or delivery at either end, the charge for the whole amounting to 8s. 4d. per ton, bringing the rate for prime up to 50s. per ton. The profit to the company upon the iceing was also very large. To smack-owners and others the package rate was calculated at 23s. 4d. per ton; barrels of fish were charged at the rate of 2s. 6d. per barrel, and cod at the rate of 30s. per ton.

For vegetables in large quantities the rates were for 2-ton lots, 9s. 2d.; for 5-ton lots, 8s. 4d.; for coal, 8s. 9d. per ton, 4-ton lots. Beer was carried for 9s. a ton, this amount including hauling from the store, in addition to which the beer was conveyed by the quick route. From that letter it would be seen what enormous charges were levied for fish, and what low rates for other goods. The next document to which he might refer, was a receipt for 8s. 11d. which he paid for one box containing twenty-nine lobsters sent from Garve, which was as much as the lobsters fetched. The rate for Cornish mackerel was 80s. per ton; Scotch rates for herrings, 76s.; from Wick, 80s. The rates of railway carriage from Ireland were extremely heavy; for cheap fish, herrings and mackerel from Cork, the rate was 85s. per ton; mackerel from Holyhead, 75s.; mackerel and herrings from Milford, 65s. 6d., the carriage of sprats being 7s. 6d. per barrel, 6d. being charged for delivery. Before any one could send fish to Billingsgate or to any of the

great centres, the consignor had to sign an undertaking that the charges would be paid for the gross weight as ascertained at the sending station without reduction for subsequent diminution in weight or by leakage. Now it was well-known that fishermen could not send fish without it being packed in ice, and every mile travelled the weight decreased by the melting of the ice, so that when the consignment reached its destination it was considerably reduced in weight, though the full weight at starting had to be paid for. The letter went on to state that the rate from Rotterdam to London was 10s. per ton extra ; but if the journey was broken at Harwich, the local rate had to be paid the same as upon English goods. The Dutch could send goods cheaper from Rotterdam to London, than it was possible for Englishmen to send goods from Harwich to London. Fish from Antwerp and Rotterdam were charged 20s. per ton to Harwich—through to London 30s. per ton. The next letter which he had received was from Mr. Browning of Torquay, who stated that having inquired into the rates charged by companies, he found that the rates for best fish when sent by “perishable” train, were £3 per ton, by mail train, £4 15s. per ton ; common fish by “perishable” train, £2 10s. per ton, by mail train, £4 8s. per ton. The rate for all kinds of fish to Paris was £4 14s. 5d. ; the rate for vegetables was £1 12s. 6d., and for colonial produce 30s. per ton. He had received a list of the charges made by the North-Eastern Railway Company for carrying different articles from Whitby, which was as follows :—

WHITBY.

	£	s.	d.
Foreign jet, to and from London . . . per ton	2	10	0
English jet „	4	10	0
Old potatoes, turnips, onions, carrots, less than 3 tons	1	17	6
„ „ „ „ 3 tons and above	1	3	4
Other vegetables, loose less than 3 tons	1	17	6
„ „ 3 tons and above	1	3	4
Vegetables, packed under 1 ton	2	10	0
„ „ 1 ton and under 2	1	17	6
„ „ 2 tons and above	1	3	4
New potatoes, in two-ton lots and above, during the months <i>April, May, and June</i>	1	17	6
Wood hoops, less or more quantities	1	17	6
Rope and oil.—Special rate for rope, cod-oil, in 2-ton lots	1	8	4
Ale, porter, and heavy groceries, such as sugar in casks, vinegar, soap	1	8	4
Second class.—Bacon, hams, salt, butter, cocoa, candles, lard, coffee, sago, starch, tapioca, and salt provisions, Whitby and Scarbro'	1	10	0
Agricultural seeds, biscuits, oranges, canvas, leather undressed	1	17	6
Figs, raisins, lump sugar, wines and spirits, in casks and cases	2	0	0
Tea (small quantities)	2	13	4
Fresh meat	3	3	4
In small lots.—Foreign preserved meats, in tins; fresh butter	1	17	6

Fish Rates, Owners' risks.

	Rate.
Goods train —Cod, ling, white herrings in brine	1/6 1 10 0
„ Red herrings, or dried cod and ling	1/8 1 13 4
Fish trains.—Herrings, packed in ice { At Com-	2/0 2 0 0
„ Herrings, packed in salt { pany's risk.	
„ Kippers and bloaters { 25 per cent. more	
„ Kipperd salmon and crabs . .	2/0 2 0 0
Fresh salmon, haddocks, cod, mackerel, lobsters	2/9 2 15 0
„ soles, plaice, codfish	2/9 2 15 0

He had also received a list showing the rates charged by the South-Eastern Railway Company for carrying the different goods from Hastings. The list was as follows:—

CARRIAGE OF DIFFERENT GOODS BY LUGGAGE TRAIN FROM
HASTINGS TO LONDON.

		£	s.	d.
Fish, fresh	per ton	1	2	6
Vegetables	"	1	0	0
Corn	"	0	11	3
Coals, in 4-ton lots	"	0	7	6
Rail, rod and bar iron, in 2-ton lots	"	0	11	3
Drapery	"	1	8	4
Sugar, moist	"	0	13	4
Coffee	"	1	0	0
Spirits and wine, in casks . .	"	1	0	0
" " in cases	"	1	8	4
Fruit, ripe	"	1	8	4
Furniture	"	1	9	2
General luggage	"	1	9	2

PASSENGER TRAIN.

Fish	per ton	2	5	0
Collection for fish here . . .	"	0	3	4
Delivery in London	"	0	5	0
Total cost from Hastings fish-market				
to Billingsgate		2	13	4

He had also received a letter from Mr. Pringle, of Newton-by-the-Sea, Northumberland, who stated that the rates by the fish train from Newcastle to London were 3s. 6d. and 4s. 2d. per cwt.; to Birmingham, 2s. 3d.; to Derby, 3s. 3d.; these rates being all at senders' own risk. If the goods were sent at the risk of the railway company, the rates were 25 per cent. additional. It had lately been stated that the rates for fish upon the South-Eastern line

had gone up 75 per cent. since the opening of the Exhibition, though he hoped this statement was not true. He had received a communication from Mr. Summers, of Ramsgate, stating that the charges by the South-Eastern Company were, for prime fish, 40s. per ton; offal, 22s. 6d.; coal and minerals, 6s. 5d.; vegetables, 20s.; corn, 9s. 7d.; 2 tons, 7s. 6d., and 4 tons, 6s. 8d. By the London, Chatham, and Dover line the charge for prime fish was 40s.; for offal, 22s. 6d.; coals and minerals, 6s. 5d.; for corn, 6s. 8d.; and for vegetables, 20s. per ton. He had also received a letter from Mr. D. Veal, of St. Ives, who stated that the rate for mackerel was £4 per ton; for common fish, £3; for new potatoes, £3 5s.; and for broccoli, £2 7s. 6d. per ton. From a letter which he had received from Mr. W. H. Murray, Peterhead, it appeared that the rate for fresh fish per passenger train was 3s. 9d. per cwt., if carried at owner's risk, and 4s. 8d. if carried at company's risk. Beef was carried at 77s. 6d. per ton at owner's risk, and 85s. per ton at company's risk. Cured goods were carried at 76s. per cwt., the rate by steamer for fish being 25s. Mr. James Sellars, of Scarborough, had written to say that one class of fish, sent at owner's risk, was carried at 35s. per ton, provided a load of 3 tons was sent; other fish was carried at 40s. per ton, and another class at 55s. per ton, though much lower rates were charged for vegetables. Mr. David Murray, of Cellardyke, had written to say that the rate by the North British Railway was 3s. 9d. per cwt. by passenger train, 1s. extra being charged if carried at company's risk. The steamers carried fish for 2s. 6d. per barrel, but the charge by railway was 7s. 6d. The next letter was from Mr. Jennings, of Harwich, and was as follows :—

HARWICH ; *July 1st, 1881.*

DEAR SIR,—In answer to your note, I send you the List of Charges by rail.

Owner's risk.

From Rotterdam or Antwerp to Harwich—	£	s.	d.
Shrimps per basket	0	1	0
Cod, or plaice, or other kinds of fish per ton	1	0	0 to Harwich
Shad „	1	0	0 „
Smelts per basket	0	0	4

From Harwich to London—	£	s.	d.
Cod in larger vans on week days . . .	3	0	0
„ small vans „ . . .	2	5	0
„ on Sundays in large vans . . .	3	15	0
„ „ small vans . . .	2	5	0
Offal fish per ton	1	5	0
Shrimps „	1	9	2
Herring or sprats „	1	3	4
Lobsters „	1	15	10
Mackerel „	1	15	0
Whelks „	1	0	0
Cod in packages „	1	10	0
Live haddocks „	1	10	0
Eels „	1	10	0

All kinds of Fish 20 per cent. extra charge on Sunday.

From Harwich to London, at Company's risk—	£	s.	d.
Offal fish per ton	1	9	2
Herring or sprats „	1	6	8
Shrimps „	1	14	2
Whelks „	1	3	4
Lobsters „	2	1	8
Soles and turbot „	2	5	0
Mackerel „	2	0	10
Cod in packages „	1	15	0
Haddocks „	1	15	0
Eels „	1	15	0
Large van of live cod „	3	12	0
Small „ „ „	2	14	0
Large van of haddocks „	3	3	0
Small „ „ „	2	11	0

Haddocks in van, at Owner's risk		£.	s.	d.
Large van	per ton	2	12	6
Small van	"	2	2	6
From Harwich to Norwich, at Owner's risk-				
Shrimps	"	1	6	8
Plaice	"	1	8	4
Salmon	"	1	8	4
Sprat and herring	"	1	3	4
Haddocks	"	1	3	4
Crabs	"	1	3	4
Eels	"	1	3	4
Cod	"	1	8	4
Mackerel.	"	1	8	4
Shell fish	"	1	8	4
Fresh fish of all kinds	"	1	15	0

The above is a true list of the railway charges.

Yours respectfully,

J. JENNINGS,

Wholesale Fish Merchant, Harwich.

He thought it was most important to the fishing industry of the British Islands that some resolution should be passed that day relative to the enormous charges now being levied by the railway companies. He had himself received barrels of salmon, which had come 1,000 miles north of California, and were delivered into the London market at £1 per barrel. It was monstrous that a barrel of herrings should cost 7s. 8d. to come from Glasgow to London. The charges now levied by the railway companies for carrying the common sort of fish prevented the fishermen from sending it to London. He declared emphatically, on behalf of the fishermen of England, that it was a great drawback upon the men that they had no means of sending the fish to market and receiving a fair percentage for their labour. He thought the time had now arrived when the Executive of that Exhibition or a

Committee should appeal to the Government or to the Railway Commissioners, to hear what could be said upon this important matter. Fishermen did not suffer at one port only, but at every port around the coast, in consequence of the charge for the carriage of fish being 30 per cent. more than that for vegetables. He was quite ready to give the companies all the credit to which they were entitled for having provided special trains for the carriage of fish ; but still he thought the charges were excessive.

Mr. SMITH (Brixham) said the trawlers at Brixham caught a large amount of ray, or roker-fish, as it was called in London, and six or seven years ago they disposed of this to the French fishermen, but the French Government having discountenanced the practice, the question arose as to how this fish should be disposed of as an article of food. He tried to dispose of some of it in the London market, and his own vessel having from Monday to Wednesday caught twenty-three dozen of large wray, he got twelve pads and borrowed seven packages off a fish salesman, and sent the fish to Billingsgate market, where it realised the sum of £6 14s. 0d., but after paying the charges it left him with a sum of £2 9s. 0d., out of which he had to pay for the pads. On inquiring why the amount returned to him was so small, he was told by the salesman that it was owing to the excessively high railway rates. They had found that it did not pay to send roker-fish to London from Brixham, and consequently it was sent abroad.

Mr. SALMON (Grimsby) thought that if the rates for the carriage of fish were lowered, there would be more sent to the midland counties, and the poorer classes would thus have an opportunity of obtaining a wholesome food at a cheap rate.

Mr. HELYARD (Great Yarmouth) said that during the

time he had been engaged in fishing, which extended over a period of thirty years, he had seen the breaking up of several fishing fleets in the North Sea, owing to the excessive rates charged by the railway companies. Two fleets of which he was admiral, one belonging to Mr. Fleming Hewitt, and one to Mr. Morgan, had been broken up solely for this cause. At one time when he was in command of 180 sail, a tremendous quantity of fish were taken, each vessel having over thirty trunks of large plaice. The question arose as to what should be done with the fish, and most of the captains, not having any boats to forward it to London, came to the conclusion that it was better to throw the fish overboard; but one or two fitted up three vessels and sent the fish into Yarmouth, from which place it was sent by rail to London, the price realised being £6. Of that sum his share came to £1 4s. 0d. On another occasion when a large capture of fish had been made, it was sent to Ostend, and a very good price realised. The heavy rates charged by railways was not only the cause of the breaking up of the fleets and the stoppage of a large supply of fish in the London market, but it was the cause of fishermen's wages being reduced, thus causing them great misery. It did not matter how many fleets were established, or what amount of capital they had at their backs; it was a dead certainty that however much fish they caught, if they sent it to London it would not be very long before they came to grief. Of course his remarks only applied to the deep-sea fishing. Speaking upon the trawl fishery, he should advise the owners of trawlers not to grumble at the railway companies, but to at once enter into competition with them and beat them. Fish would never come within the reach of the poor of London while it had to be conveyed by railway; the only

way in which the price could be reduced would be by conveying it by water.

Mr. BLOOMFIELD said that competition might answer very well along the south coast, but as to competition by Ireland, that was utterly out of the question. When he spoke of railway rates it was a question of life and death to the fishermen of Ireland, and not only so, but a most important matter as regarded the public generally, especially the people of London. Perhaps he might be permitted to quote the words used by H.R.H. the Duke of Edinburgh when speaking upon this subject. H.R.H. said—"How many of the inhabitants of these Islands, even including our dwellers on the sea coast, have a conception that if from any cause the myriads of fish at present swarming on our seas were this afternoon to retreat to the depths of the ocean beyond the range of man's appliances for capturing them, to-morrow half a million of our fellow subjects would be looking starvation in the face." Those words were golden, and ought to be borne in mind by every one in considering this question. They had to fight a large corporation that had something like 700 millions of money at its back, and if they were not supported by the public generally, it was a farce for them to hold these meetings. It had been stated that the freights charged for the carriage of fish amounted to £4, but he could assure that meeting that the freight from Ballyshannon to London was £5 11s. 6d. per ton for offal fish, but this was at owner's risk, an impossible alternative in so perishable a commodity. In addition to that, twenty-five per cent. was charged if it was sent at the company's risk. Unless something was at once done to compel the railway companies to lower their rates, they would soon be in the position in which they were upon the other side of the Atlantic. He held in his hand an

extract from an American paper of a meeting which was held in America to check the growing evil of railway monopoly. Judge Black, in addressing the meeting, said : " It is alleged that the railroad corporations, being put into possession of the public highways of the country, are bound in law and justice to run their roads in the interest of the public to whom the highways belong ; that they are public servants and trustees, but that they have violated their trust most grossly and shamefully." " Is it true, or is it not true ? If it is false, then the railroad men are in the interesting position of much injured and ill-used individuals, for they are being foully slandered by every man who talks about them at all, and they are the subjects of continuous libel in the newspaper press of the whole country. If it is false, this league ought to dissolve at once, and you, gentlemen, ought to hide your heads in shame for having engaged in a movement against the honest, disinterested, and upright citizens who run your railroads for you. But, if it is true, you are engaged in one of the noblest works that human hands ever undertook to accomplish ; and if you succeed, you will earn and receive the gratitude of a redeemed and regenerated people." Further on Judge Black said : " The General (Garfield) described the immense power which these railroad people wield, referred to the large endowments which had been bestowed on them, and their solid combination, and warned his hearers that the time was coming when a conflict would occur between them and the Government, in which the Government would be overthrown if the railways were not throttled before." " We must allow them to start with all to which they are entitled—a liberal compensation for their services, the cost of keeping their roads in repair, and a fair profit on the capital invested." This started a

question which they ought to have thrashed out in England, namely, whether the public carriers of this country, in the shape of railway directors, were merely men absolutely controlling the transit by independent companies, or whether they were not amenable to Parliament even for the freights which they charged. He maintained that a correct view upon this subject had been taken by their friends upon the other side of the Atlantic; upon that view they acted, and it was the view upon which English fishermen should ground any complaint they had to make. If the International Fisheries Exhibition had not been inaugurated by the gentlemen who were on the Executive Committee, and notably by the Prince of Wales and his illustrious brother, they would never have had a chance of getting things put right; and if they were to lose the opportunity they now had of sending forth some strong resolution upon the subject, there was no use in meeting in that room, or of talking of the rings of Billingsgate, &c. The thing to alter was the rates at present being charged. He might mention that he had lately noticed a case reported in the paper of an action brought against a railway company for loss occasioned by fish being destroyed in transmission, the fish being carried at the risk of the owner, and a verdict was recovered against the railway company. It was not generally known that when fish was carried at the owner's risk that the company were liable for any loss which might be occasioned, and therefore he thought it as well that the facts should at once be made public. It was all nonsense to say that poor people would not eat fish; the fact was, that they could not obtain it at a fair price, and unless the railway charges were considerably reduced, it never would come within their reach.

Mr. ROBERT GIBBS (of Banbury) hoped there were some

gentlemen present from large inland towns. He came from exactly the centre of England, but it was only a small town, and it appeared to him the railway rates were almost prohibitive of fish being sent to inland towns. Take the rates, for instance, from Inverness, Newhaven, and Anstruther; the principal fish they got from there were sprats and herrings; only this last week they had sprats from Inverness, and the rate he was paying was £4 5s. per ton, which, he maintained, was much too high, and he hoped a resolution would be passed asking the railway company to lower the rates. In his district three times the quantity of fish could be sold if the rate were lowered; and it seemed to him a great anomaly that fishermen should go out to catch fish, bring them in to Inverness, and get less for them than they cost for carriage. He had known sprats sent to Birmingham, and the consignees had to call on the fishermen to send up money, because they had not made as much by them as the carriage. They got mackerel from Kinsale, and herrings from Rowth and Arklow; the rate from Kinsale to Banbury was 8s. 6d. a box of two hundredweight, and herrings from Howth and Arklow were about the same rate. Those mackerel were a grand fish, and ought to be brought into the inland towns for the sake of the population. He was a member of the Town Council of Banbury, and a Poor Law Guardian, and he was glad to say they were now introducing fish into the unions; but the rates ought to be lowered, so that poor people who were just on the verge of pauperism should be able to eat fish, whether it were of the class called roker, dead cod or haddock, which, when well iced, was a good and wholesome fish, though, of course, not equal to live cod, which they had to supply to their regular customers. It was a great anomaly that the carriage of sprats and herrings was £4 5s. a ton, whilst the

average price of sprats would be about 2*d.* a pound, and salmon, the average price of which would be from 1*s.* 6*d.* to 1*s.* 9*d.* a pound, only paid the same rate.

Mr. MOORE (of Bristol) said he was not a practical fisherman, but he had visited a great many of the fishing-grounds. When at Youghal he bought a small box of salmon, and having inquired of the station-master whether the company would guarantee the delivery of the box, and being answered in the affirmative, he forwarded it, but from that hour to the present he had never received any money for it.

Mr. SAYER said he considered that Ireland and Scotland had great reason to complain of the excessive railway rates, which was the cause of so little fish coming to London. The rate for mackerel from Kinsale to Billingsgate is 8*s.* per ton, or about 1*d.* for each fish; and from Milford to London the rate is 62*s.* 6*d.* per ton, while that for coal is only 8*s.* 4*d.* A short time since Irish mackerel was sold in Billingsgate at 12*s.* per box of 120 fish. The cost of carriage, icing, &c., is 14*s.* per box, showing a clear loss of 2*s.* per box in the expense, to say nothing of the cost of the fish. With respect to Scotland, on Thursday last about 1,000 barrels of sprats were sent from Inverness, which realised gross £800 to £900. The railway carriage amounted to about £550, which left only £300 for the fishermen, buyers, and sellers. Frequently this kind of fish has to be sold for manure, the prohibitory rates preventing its being sent to market without entailing serious loss on the merchant. Last season a million barrels of herrings were cured in Scotland for Continental markets, the freight being 1*s.* 6*d.* to 2*s.* per barrel. A large portion would doubtless have been sent to London, but for the heavy charge of about 12*s.* per barrel. He was of opinion

therefore, that the railway companies by their heavy fish rates were the sole cause of the common kinds of fish being so dear in London. Through the Fisheries Exhibition a greater demand had been created for this kind of fish, and he thought the present was a good opportunity to try and induce the railway companies to revise their fish rates; and he hoped with the assistance of the Chairman, who had worked so thoroughly for the interest of the fishermen, and still continued to do so, that something would be done by which these fearful rates might be reduced, and the poorer classes benefited.

Mr. Sayer then handed in the following Tables:—

RATES FOR CARRIAGE OF FISH TO LONDON.

Railway.	Where from.	Rate per Ton.	—
Lond. & North-Western and Great Northern	Scotland .	75/0	Owner's risk. 5/6 delivery for herrings, &c.
Midland & Great Northern	„ „	87/6	5/6 „ prime fish.
	Scarboro' .	40/0	For herrings, &c. } 5/0
	„ „	55/0	„ prime, } per
	„ „	42/6	„ loose fish in van, } ton.
	Grimsby .	25/0	„ „ truck.
	Hull .	35/0	„ „ van, and
	„ „	30/0	5/0 for delivery.
Great Western . . .	Plymouth .	60/0	„ packages.
	„ „	45/0	„ mackerel, cod, &c.
	St. Ives .	70/0	„ herrings.
	„ „	53/4	„ mackerel, cod, &c.
	Falmouth .	65/0	„ herrings.
	„ „	50/0	„ mackerel, cod, &c.
South-Western . . .	Plymouth .	60/0	„ herrings.
	„ „	60/0	„ mackerel, herrings, &c. (collected and delivered).
Lond., B. & South Coast.	Brighton .	21/6	„ mackerel, herrings, &c. (5/0 extra for delivery).
Lond., Chatham, & Dover	Ramsgate, Deal, Dover, &c.	22/6	„ mackerel, herrings, &c. (including delivery).
	„ „	40/0	„ prime fish (including delivery).
South-Eastern	„ „	40/0	„ prime fish (including delivery).
	„ „	22/6	„ offal, including delivery
Great Western	Milford .	65/6	„ mackerel ; coals 8/4.

Railway.	Where from	—
Great Western	Plymouth .	Mackerel, cod, &c., 60/0 per ton ; herrings, 45/0 per ton.
	St. Ives .	Ditto ditto 70/0 per ton ; herrings, 53/4 per ton.
	Falmouth .	Ditto ditto 65/0 per ton ; herrings, 50/0 per ton.
South-Western	Plymouth .	Cured fish, 24/2.
	" .	Mackerel, herrings, &c., 60/0 per ton; collected and delivered.
L., B. & South Coast.	Brighton .	Mackerel, herrings, &c., 21/3 per ton, delivery 5/0 per ton extra.
London, Chatham, & Dover	Ramsgate, Dover, Margate, &c..	Mackerel, herrings, &c., 22/6 per ton, including delivery.
	"	Prime fish, 40/0 per ton.
South-Eastern	Ramsgate, Dover, Deal, &c.	50/0 per ton, delivery 5/0 ton extra (time table) <i>parcels rate</i> .
	Yarmouth .	Prime, 32/6 per ton.
Great Northern, Midland, and Lond. & N.-Western.	" .	Common, 21/8 per ton ; Beer, 9/0 per ton.
	Scotland .	Owner's risk, 75/0 per ton ; delivery 5/0 per ton, herrings, &c.
	" .	87/6 per ton, prime.
	Scarboro' .	40/0 per ton, herrings, &c.
	" .	55/0 per ton, prime.
	Grimsby & Hull.	Truck, loose, 25/0 per ton
	"	Van, loose, 35/0 per ton.
	"	Packages, 30/0 per ton.

His Royal Highness the DUKE OF EDINBURGH said the subject now before the meeting was one of great importance both to the fishermen and to the consuming community, but it was one to which he had not devoted special or particular attention, and a subject to which he did not allude in the small Paper which was read at the opening of the Conferences. He had hoped to have had an opportunity of saying a few words upon the subject which would come on later, namely, that of better means for the prevention of loss of life at sea, that being one to which he had devoted some attention ; but he regretted to say that his engagements would not allow him to remain. He thought it would be a very good thing if the resolution which was about to be proposed were to bring about a reduction of the rates, by

which means both the fishermen and the public at large would be benefited.

Mr. MURRAY said he had much pleasure in moving the following resolution : "That this Conference of Practical Fishermen having heard the disastrous and destructive effect upon the fishing industries of the United Kingdom through the excessively high charges of the railway companies, which prohibit the distribution of good wholesome fish throughout the country at a cost within the reach of the poorer classes, are of unanimous opinion that some pressure should be brought to bear upon the Railway Commissioners ; and that Mr. Birkbeck, M.P., be requested to forward this resolution to the Commissioners."

Mr. J. SAUNDERS seconded the resolution, which was put to the meeting by the Chairman and carried unanimously.

"HARBOUR ACCOMMODATION," AND "BETTER MEANS FOR PREVENTION OF LOSS OF LIFE AT SEA."

The CHAIRMAN said the prevention of loss of life at sea was a subject in which everyone was deeply interested, but no one more so than himself, as he had the honour of being the Chairman of the National Life-boat Institution. The question resolved itself into whether any other steps could be taken to prevent the loss of life which occurred from time to time, especially in the winter months on board smacks in the North Sea. A Board of Trade Committee last year visited Grimsby, Hull, Scarbro', Lowestoft, Yarmouth, Brixham, and Penzance, and took evidence from skippers of smacks, crews, and also owners upon this sub-

ject, and the evidence pointed to the fact that the loss of life occurred most in the ferrying of fish from the catchers to the carriers, though he thought that that loss had been very much exaggerated, and that in many instances the hands had been washed overboard, or knocked overboard by the boom or the tiller. The question of the ferrying was not in the minds of the Committee so serious as they anticipated when the inquiry was first opened. The Executive of the Exhibition had received an order from Mr. Edwards, of Lowestoft, of a prize of £60 for the best smack's boat for the conveyance of fish from the smack to the steam-carrier, but the Jurors had inserted a very important clause in their report to the effect that there was not one boat in the Exhibition which they considered worthy of the special prize. He was sure that that was a disappointment not only to Mr. Edwards, but to the Executive and the public at large. The Committee also considered whether there was any dress which might be worn by fishermen who were employed in the boats, and the result of their inquiries at various ports led them to the conclusion that although cork jackets were provided by the owners the men would not wear them for fear of being laughed at by their fellow-men. That was an unfortunate state of things. The crews of life-boats were compelled to wear cork jackets, and, therefore, he thought the owners of smacks should compel their men to do the same. With regard to the question of harbour accommodation, that was a subject which had been ventilated by the Select Committee of last Session, and the only point to which he would allude was one of paramount importance, viz., that the Government should allow more convict labour to be employed in constructing harbours of refuge to give the fishing community that accommodation

round the coast which they certainly ought to have. He noticed that the question of raising the money at a low rate of interest was discussed in the report, and he believed that the Government would consider the question of employing convict labour in the construction of harbours of refuge.

Mr. JEX said that as one of the Jury of the No. 5 division of the International Fisheries Exhibition, he had examined minutely into every detail connected both with boats used for the conveyance of fish from the smacks to the steamers, and the Jurors had come to the conclusion that there was nothing in the Exhibition sufficient to merit the award of the special prize of £60. They had recommended that the Executive should write to Mr. Edwards to get his consent to this prize standing over for six months, and that the award of the gold medal offered by the Executive should stand over for the same period in order that boat-builders might have another opportunity of producing some boat to meet their requirements. A great number of men were lost when the boats were returning empty from the steam-carrier or cutter, the boats being light, and in a cross choppy sea get struck aft, and get what is technically known among fishermen as pooped, then upset ; and when the boat is capsized, the men generally place themselves in the midship section, and are then washed off by the sea. I have frequently recommended that a line be run the length of the keel from stem to stern, and spliced, so that the men should have the means of righting the boats. If they would get as near to the stern post as possible they would go with the boat, and not run so much risk of being washed repeatedly off the boat and lost.

The CHAIRMAN announced that the Executive had written to Mr. Edwards asking him to allow his prize to remain open for another six months.

Mr. JEX was very glad to hear that that had been done. One boat had been exhibited of a carvel-build ; but it was not at all suitable for carrying fish to the carrier, because a man in a short sea would very often drop a trunk of fish in order to save his life, and the edge of the trunk coming down upon one of the planks, the boat would become water-logged, and she would sink up to the buoyancy that was in her. The boat had cork all round between the gunwale and the thwarts, and if such a boat was upset the leverage being on the top, it would take six of the strongest men to right her. Saving life at sea was one of the most important subjects of the Exhibition. It was well known that many of the lads fell over in dipping a bucket of water, or from the vessel giving a sudden lurch, and if any means could be devised for saving these lives, it would be a step in the right direction. He had provided life-belts for the men on his vessels, but they would not wear them.

Rev. Mr. BERTHON said he stood before them as a theoretical inventor ; but as the canvas boat which had been invented by him had been proved to be the very best boat yet brought out, he thought that would be a sufficient excuse for his addressing the meeting. His canvas boat might be banged against the ship's side without hurting it, as it would at once bound off, and it would go through any sea without sinking. One of these canvas boats would not occupy more than about a foot of the gangway of a smack, and it could be instantaneously opened, when it at once presented the form of a very perfect lifeboat with enormous air cases at the end, by which the boat would right itself in the event of its being capsized. When used as a ferry boat for the conveyance of fish from the trawler to the carrier, the boxes would be entirely encased in wood. The thwarts were made to collapse or not, and the

boat could also be made self-delivering, as well as self-righting. If by any accident the boat was injured, the water did not get in, as there were a number of air compartments. When the boat was returning empty from the steam carrier, water might be carried as ballast. The boat was so constructed that if it was found dangerous for men to row it to the steam carrier it might be allowed to drift, and the carrier could pitch a grapnel over the painter and take the fish on board, and then return it in the same manner to the smack. Had he known that a special prize had been offered for a boat for this particular purpose, he should have devoted his attention to providing such a one. He had already received a gold medal for a collapsing boat, and a diploma for the one which he had just described.

Mr. JEX said the Jury had minutely examined the boat exhibited by Mr. Berthon.

Rev. Mr. BERTHON said the boat exhibited by him had not been sent to the Exhibition for the purpose of competing for the special prize.

Mr. BUGLES (Berwick-upon-Tweed) said it would be a great blessing to his town if a harbour was constructed there, so that fishing-boats might go in and out at any time. At the present time they had no kind of shelter whatever on the Berwick coast, but he was happy to say that a company had now been formed for the construction of a harbour at Berwick, and he should be happy to show any one the plans which had been prepared.

Mr. HELYARD said the subject of preventing loss of life at sea was one to which he had devoted his attention for the last thirty years. In his opinion the fishing vessels were not large enough or strong enough ; they were good enough for fishing, but they were not strong

enough to withstand the heavy seas they sometimes encounter. He suggested that fishing vessels should be of 200 tons, and propelled by steam. He knew that fishermen would not wear the cork life-belts ; in fact, at one time he would not wear one, though he had now altered his opinion with regard to them. He had tried to induce the men under him to wear air-belts, but they would not put them on. On one occasion he persuaded them to put them on before they went into the boat to convey the fish to the carrier, but he noticed when they returned they had not them on. He thought the admiral of the fishing fleet, and the captain of the cutter, should have authority to give orders when the operation of conveying the fish to the carrier might be performed with safety ; at present they had not the power, and if the men were ordered to convey the fish they were bound to obey the orders, or else they would have to go to gaol for neglect of duty. In conclusion, he suggested that the master of every fishing vessel should be qualified in the same way as pilots were by the Board of Trade.

The Conference then adjourned for luncheon.

Mr. SMITH (Brixham) said the place from which he came had a population of 7,000, the number of fishing vessels being 180. The insured capital invested in the business was £90,000, but there was not harbour accommodation for these 180 vessels. He need not go back to 1866 and narrate the results of the terrible gale of wind which then occurred, as it would be, no doubt, within the recollection of all, when wives sat at their windows and witnessed the loss of their husbands close to their own doors. There were 100 fishermen on board their vessels at the same time, riding to a piece of large chain which

was laid down in a north-east and south-west direction, which they called the moorings. He was on board a vessel that night, expecting every moment to be swamped. They said in that neighbourhood Brixham was a little place at one end of the world, but they felt that they ought to bring it out, make it more prominent, and show the Government that it and other ports were without harbours of refuge. He therefore begged to move the following resolution:—"That in view of the great want of harbour accommodation round the coast of the United Kingdom, we pray that Her Majesty's Government will, without delay, carry out the recommendations of the Select Committee of last session, and thus prevent the continuance of a state of things which, while crippling the resources of the country, and annually injuring a great industry, fills the papers with terrible disasters, leaving hundreds of widows and orphans to excite the sympathies of the country."

Mr. SAUNDERS (Brixham) seconded the resolution. As Mr. Smith had remarked, there were 180 vessels belonging to Brixham, and there was only harbour accommodation in spring tides for from forty to sixty, and in neap tides for from twenty to thirty; all the rest had to ride to moorings in the outer roads, where they were exposed to the full fury of the easterly gales. In a gale which occurred something like six years ago, six vessels were totally lost on the rocks, fourteen were two months in harbour repairing, and then were driven right up into the main street.

Mr. ROGER MOORE (Bristol) supported the resolution, in the hope that the matter would be taken in hand by the Government, and that something practical would be done. The place he occupied that day would have been filled by

the leader of the organisation with which he was connected in the West of England, Mr. Samuel Plimsoll, had he not been kept away by domestic affliction. One question had been touched upon by the Chairman which he thought required consideration at the present moment, namely, the utilisation of convict labour. On many parts of the coast there were places where this labour could be utilised without any extravagant expense in looking after them. Amongst them he might especially allude to Lundy Island, in the Bristol Channel. This place offered great facilities for the protection of vessels, being in proximity to the open sea, a short distance from Penarth Roads, and shelter could be afforded there in stress of weather, which would much reduce the loss of life. He was glad to see that in Ireland they had obtained small grants from the Government, and had in some places carried out some improvements; but Government had not yet assisted the Irish fishermen on the south and west coast to the extent that was desirable.

Mr. BLOOMFIELD said, as far as Ireland was concerned, £250,000 had been allocated for harbours, and in a short time they hoped the Government would see to its being expended in the best manner possible.

Mr. HEPTON (Grimsby) said he felt at a very great disadvantage in speaking on this subject. He had heard it said that a good way for a man to become a public speaker was to go into the fields and talk to the trees, and he would not mind spending five years talking to the trees if it would only enable him to find words to express what he felt with regard to the prevention of loss of life at sea. It might seem rather curious, but, having thought on this subject a great deal, he was convinced that the one they were speaking about yesterday, viz., the destruc-

tion of immature fish, together with those to-day, viz., railway rates, harbour accommodation, and loss of life at sea were so much intermingled, that before this, the most important from a sympathetic or human point of view, can be in any way benefited or the loss of life mitigated, some alterations must be made in existing laws, regulations, or arrangements in these matters to which the previous subjects referred. The question was, how were these lives lost, where were they lost, and why were they lost? It had been explained that many lives had been lost in fleeting; many were lost through unaccountable causes, easily lost, one almost wondered how they could be lost; they fell overboard unaccountably, if it were fine weather they were often drowned, whilst if it were in the winter time some who could hardly have missed being lost were saved. Some were lost overboard taking in the jib; they pitched head foremost into the sea, and then there was no possibility of saving them, for by the time they could get something to throw to them the vessel had fallen off to leeward, and they were out of reach; some were lost putting up side lights, and some drawing buckets of water, but these were only isolated cases. There were about ten-fold more lives lost on the east coast between Lowestoft and the Spurn to what there were all round the British coast; he could hardly tell the reason, but it was principally due to heavy seas rolling abroad, and fleeting. If there was any one on deck and they saw a sea coming, they sung out "water;" that meant, hold on to something if you could, or get down below; and if a man got washed overboard at that moment, all the hands on deck, who alone could save him, had as much as they could do to look out for themselves, and by the time they could do anything he was gone. One reason so many were lost on the east

coast was because the vessels had to go right away out to sea, and when a gale of wind came on it was impossible to try to run home to harbour, because there would be more danger in so doing than in stopping where they were. The greatest danger lay in large fleets being congregated together. The heavy railway rates making the fish cost so much in sending from the ports, made it almost impossible for the single boats to get a living, and led to the fleeting system, and sending the vessels further out. If they could send their fish at a reasonable rate from any port, they would not be obliged to congregate in such large fleets. The dangers of fleeting were very great; lots of lives were lost by boating. Although a man might walk about on deck with a life-jacket on, when he had to pick up a large box of fish and hand it up higher than his head, he did not want to be crippled with life-belts and jackets, he wanted to have everything free about him so that he could use his strength. That was why they did not like these appliances, not because they were afraid of one another chaffing. Fear was a word unknown amongst fishermen. Unfortunately there was a discussion going on at Hull amongst the fishermen, which precluded him from saying as much as he might with regard to the fleeting, lest it might be thought that he was a partisan. But great losses took place last winter amongst the Hull vessels, especially amongst those who had been fleeting. It was proved that there was more loss of life through the fleeting or boarding system during the winter months than in single vessels. It was said that vessels should go fleeting to have a fresh and regular supply for the public; but he urged that this was not so, providing railway rates were made so reasonable that the public could have their fish brought from any part of the coast to the great centres. The reason for the great

fleets was, that such a large percentage of the earnings was taken in railway carriage, that owners could not make it pay. Now during the last three months, the supply at Billingsgate was about 230,000 boxes, an average of 17,700 a week, or nearly 3,000 a day ; but the number of days this average supply reached London was only nine for the whole period of thirteen weeks ; there had been about twelve days when under 1,000 came to market (of course he only included market-days), on six days there had been no steamboats there. On the contrary, on one day there were 9,100, another, 8,000, another, 7,600, and another, 7,200. That did not prove that there was an average of 3,000 boxes daily, but just the contrary. Again, taking the average weekly supply of 17,000 to 19,000 boxes, there had only been four times that quantity, twice over 23,000, and once under 8,000. Then as regarded the freshness of the fish, he would allow that steamboats were well able to bring fish fresh, provided the steamer were always there at the time when the fish was ready to be put on board ; but in winter the cutters were sometimes astray, and at such times the fish is either thrown overboard or sent to market in very inferior condition. As had been said before the Conference, on one occasion they sent away three steamboats one morning, and one the night before, and there was none left ; the fishing vessels put the gear down that night ; and he wished them to take particular notice that they wasted more fish on that occasion than all the single boaters wasted in twelve months ; and although such occurrences are not common, this is by no means an isolated case. Sometimes it happened on account of there being fresh winds, there were some men so humane that they told the skippers not to board ; but there were men in the fishing interest who would let men board, no

matter what risk they ran. He stood there as the representative of 3,000 men and boys, and felt that he must do his duty and speak the truth on this matter. With regard to the loss in the Hull fleet, it was contended that three-quarters of the damage would never occur if they were not crowded together in such large numbers. Any sea-going man would say that if he had a fine ship he did not fear a gale of wind provided he had plenty of sea room and no company; but if he was surrounded by vessels nearly as thick as the chairs in this room, he had little chance, if it were a dark or rainy night, accompanied with a gale of wind. It was urged that there were a great many vessels lost out of Grimsby, but four out of nine lost on one occasion were either in connection with the Hull fleet, or close to them. He hoped the Conference would give this subject its earnest consideration, and would be enabled to see that the questions of loss of life, railway rates, and the destruction of immature fish were all connected together. The preservation of immature fish would give more mature fish for the vessels to catch on the single boating system, and the railway rates being lowered, would give the owners a fairer percentage on the fish their vessels caught, and would put on one side the fleeting system during the winter altogether. He believed that if any man could manage to get an Act of Parliament passed which would abolish fleeting for six months during the winter, in days to come his name would be written in letters of gold. He was unable to go into any practical methods of preventing the loss of life at sea, the short time allotted to each speaker having expired, But he desired to make one suggestion that, is, that deep-sea fishing vessels should be fitted with iron stanchions and nettings from their fore rigging to the taffrail, the stanchions about four feet in

length (two or three each side), the netting to be made of strong line six inches from knot to knot, so as not to obstruct the sight. The cost would be very slight.

Mr. DAVID TAMLIN (Swansea pilot) said he could not allow the discussion to close without calling attention to the want of harbour accommodation on the coast of Wales. Swansea was not represented there by the fishing community, and, therefore, he felt bound to call attention to the want of harbour accommodation in that locality. The trade had diminished, especially the oyster fisheries, but there were still a great many boats there, and the bay was entirely open to south-westerly and south-easterly winds. The Mumbles was a most admirable place for a harbour of refuge, and he believed that the last Royal Commission recommended that one should be constructed there, and nothing had been done. If the great loss of life which took place had been occasioned by a want of sanitation there would be an immense outcry at once, but if it were a question of harbours of refuge it seemed to be shelved altogether.

Captain READ (Deal) said he came there to point out one remedy for loss of life. Steamers were constantly running down fishing-smacks, and running one another down in all directions, generally for want of some means of knowing how a vessel approaching at an angle was steering. He wished to explain a means which had been adopted in the British Navy since June 1869, and he might say that about six months ago a friend of his at the Admiralty, to whom he spoke on the subject, said he had used the invention on his ships, and no captain in the British Navy steaming with two or more ships in company would ever think of moving without it. The object was to show the approaching smack which side the steamer intended to pass him, so that he

could see in a moment if he intended to obey the law. [Captain Read exhibited the model of a steamer showing the nature of his invention, which consisted of a spar slung at the mast-head with a red globe at one end and a green at the other. When the helm was put to starboard it automatically lowered the red end; when the two were horizontal the helm was amidships.] At night the two ends were represented by a red and green light respectively. There were many advantages connected with this system. It would not only indicate whether the ship was being steered properly, it would show the captain of the ship that his lights were burning, it would also show him that the men at the wheel were not asleep. The largest ship afloat could be fitted with this apparatus for £5. When the red was above it showed that the vessel was on the port-helm, and thus gave the information which the side lights did not show. If you were running through a fleet of ships with a fair wind, all going in the same direction, there were no side lights showing at all. Captain Reid concluded by enumerating the various prizes and medals he had obtained for this invention, and by reading letters from Admiral Sutherland, Admiral Hammerton, Mr. Myles Fenton and others, speaking in high terms of the invention.

Mr. SALMON (Grimsby) said the loss of life at sea was a matter which required further investigation. From his own personal experience, he might say that they had the finest fleet of vessels sailing out of Grimsby in the world, fitted with all the latest improvements and appliances; but there were times when unforeseen accidents occurred, leading to loss of life, such as being washed overboard, boys drawing water and being pulled overboard by the bucket—not knowing how to draw it, the motion of the vessel pulled them over, and sooner than let go the bucket

they went over the side. With regard to the box-fleeting system, he believed there were a great many lost from that cause, and if it could be discontinued, he believed there would be a saving of life, as many lives were lost in attempting to save those of others. On the 28th of October, 1881, there were 55 lives lost and 11 smacks, each smack having 5 hands on board. On the 18th of October, 1882, there were 18 lives lost and 1 smack. On the 6th of March, 1883, they lost 96 lives at sea, and 12 smacks with all hands. There was a class of men and boys who could see no danger at all, and if life-jackets were put on board they were such an encumbrance that the men would not put them on. If he had a life-jacket on he should take it off, because the first necessity was perfect freedom of motion. He then handed to the Chairman to read an extract from a Hull paper, giving an account of the loss of life from a heavy gale. On the date named, 806 smacks arrived at Hull in one tide, 90 per cent. of which had been more or less seriously damaged, and from one nearly a score of lives had been lost. At the time of writing 23 smacks were missing, and it was feared the majority of these had sunk. The result was a total of 115 lives lost, which with the 20 previously reported made 135; and as to the previous gale there were 2 smacks lost with all hands, which made a grand total of 150 lives in connection with the Hull fishing fleet. Mr. Salmon said he did not say that all these lives were lost owing to the fleeting system, but if a gale of wind came on when the vessels were in such close contact, they all got crowded together, and it was almost impossible for them to escape.

Mr. JEX said he had received a letter giving some particulars of the proposed fishing harbour at Berwick. It

would have a draught of 7 ft. at low water, and 22 ft. at high water. It would be protected both north and south by outlying headlands. It would be a great advantage to the boats from the surrounding fishery harbours, and was very advantageously situated for railway communication, being close to a station at which all trains stopped. If such a harbour had existed previous to the disaster in October, 1881, many lives would have been saved. The present harbour was a bar harbour, with only 3 ft. of water at low tide, and the boats were often in great jeopardy.

(The resolution was then put and carried unanimously.)

Mr. ALWARD then proposed the following resolution: "That the large number of fishermen annually lost by drowning around the British Islands, notably in the North Sea, demands that the attention of the Government should be called to the matter, and that it should take such immediate steps to institute an exhaustive inquiry into the various causes, and ascertain what means, if any, could be devised to prevent, or at least to diminish, the same." In proposing this resolution he did not commit himself to any course which he should be sorry for. It was a generally admitted fact that the loss of life round the British coast was something appalling. The fisheries were progressing, the people were increasing in numbers, the vessels were increasing in importance and magnitude, and he thought all this showed the necessity that before any legislation took place, consultation should be held with the leading men connected with the fisheries on the coast of Britain, of course including Ireland. He made that remark for this reason: he could prove, from his own experience, that the Legislature, in their anxiety and desire to benefit the nation, often pursued a course very detrimental to those for whom

they were legislating. He would not blame them, because they did it from the best of motives ; this was mainly due to their technical ignorance, which caused them to fall into the errors which they had committed. This was brought before them very forcibly some two or three years ago, when without any warning they were told that a new regulation respecting lights to be exhibited by fishing-vessels was arranged all cut and dried, and simply put forward to be accepted, whether suitable or not. As soon as practical people had their attention directed to it, they saw that instead of preventing loss of life, it would be a fruitful source of increasing that loss. The gentleman who had brought forward a model showing arrangements of lights for indicating the position of the vessel's helm, and various other features which were very good indeed, had accomplished a good work ; at any rate he had shown that attention had been directed to a matter which was calculated to be an immense benefit. There might be little faults which could easily be overcome on consultation with practical men, and he cordially gave it his general support. In continuation of the remarks of his colleagues from Grimsby he would say this, that having been connected with commercial transactions since he gave up the sea, his ideas had become broadened, and he apprehended the difference between people all at once coming to a conclusion on a certain subject, but not giving effect to their opinions there and then without further consideration, and submitting them to the judgment of people who possessed superior intelligence, and a man rushing at once to a thing which his instinct told him was necessary. For instance, his friend Mr. Helyard, who had had charge of fleets, spoke of the size of the vessels, and said they were not large enough ; he would have a vessel 200 tons, but he might tell him,

with all respect, that it did not follow because you increased the tonnage of a vessel that you increased her safety as a sea-going machine; in fact the life-boat was one of the smallest boats which went on the water. One fruitful source of loss of life at sea in fisheries was this, that fishermen prided themselves on being a fearless set of people. The older he got the more fear he possessed, because he believed that with increase of knowledge came increase of fear; he could not boast of much knowledge, but he had at any rate learnt his own ignorance. Those who did not possess a very extensive knowledge generally had the least fear. The man who could realise the danger by which he was surrounded, who understood the force of the elements, and so on, could apprehend the dangers contained in them, but one who simply took a superficial view of the matter, and possessed all the physical courage and power necessary to perform his duties, knew nothing about fear. They had been told over and over again that life-buoys, life-belts, and all the various appliances for insuring safety, were disregarded, and one gentleman said that at one time if he had been asked to put on a life-jacket or make use of a life-buoy, he would have considered it an insult to his courage, but now he had got old enough to realise the fact that that was the most sensible thing to do to preserve his life, and to recommend it to others. He had been in vessels he had the management of, and he had on several occasions given out a full set of jackets and buoys, but the difficulties he had met with had been those which had been already mentioned, that the men treated them with contempt, and when you went on board the vessel which had been supplied with them, you found them kicking about as if they were of no earthly use. A great deal had been said about fleeing,

and there had been a Commission of inquiry held lately at the port of Hull, at which he had an opportunity lately of giving evidence on this point. A question was put to him as to the reason of going in boats for the purpose of carrying the fish under this system, and he explained that the fish were put into a small boat to be transferred to the steam vessel, which was the carrier to bring it to market. He was asked what was the intrinsic difference in danger between the two systems, and he replied that the difference was between being on the deck of a vessel surrounded by the conditions of safety, and going into a small boat which did not possess those conditions. At the same time, if those who had to board the fish discriminated, and had power put into their hands to exercise their knowledge and judgment not to board the fish when the weather was unfavourable, there would not be such excessive risk ; but, as had been stated, some admirals and masters had the power to refuse to board fish when it ought not to be attempted ; but it was also perfectly true, as had been stated, that if they did not send it when the owners were expecting it, in many instances the men would lose their situations. Again, the masters of crews and admirals of the fleet, even with the limited power they had, had very great difficulty in exercising it, because although they might make signals not to board, fishermen were of that class that they were not subject to much restraint ; every man prided himself on being at liberty to do as he chose. A Bill had been passed called the Merchant Vessels and Shipping Boats Act, 1883, and he believed in that case the Legislature tried to make themselves acquainted with the requirements of the case, but whether they went sufficiently low down he would not say ; still the leading members of the trade had a fair opportunity of expressing their opinions upon it. This

Act, amongst other things, provided that every man who took charge of a vessel, not only a master, but a mate, should have a certificate, proving that he was a competent person, either from having passed an examination or from long service. Although he believed this Act was going to confer great benefits on the trade, it was receiving very strenuous opposition at the hands of fishermen, but he believed, as fishermen became more enlightened by the spread of education, which was more required by them, perhaps, than any other class, they would appreciate it. Before the Education Act, fishermen were glad to send their children to earn their living as early as possible, and when a boy was nine or ten, he went to wake up the crew of his father's boat. He himself had served eleven years of apprenticeship, and his brothers had to follow in the same course; but a new state of things was now introduced by the Education Act, and he believed the results would be very satisfactory. If time permitted he should like to suggest that a congress be held of practical fishermen of the various ports. Fishermen were not a wealthy class, and he was sorry that in these Conferences one thing had been lost sight of. The money subscribed to further this movement might be thought to have been better employed than it had been latterly in enabling a larger number of fishermen to come to speak on these subjects. One remark he would make as to the collapsing-boat of Mr. Berthon's. That gentleman proposed a means of transferring the fish from one boat to another without jeopardising the lives of the men. It was an admirable idea, and it was a practicable thing which he had suggested. Strange to say, he had never heard it mooted during the whole course of his life before, and yet he had himself put it into effect in order to rescue the lives of a crew of a ship when sinking. He

manœuvred his vessel so as to sail round the sinking vessel when it would have been utterly suicidal to put his own crew into a boat, and when, in fact, he could not spare his crew, but he managed to place his boat alongside the sinking ship, and rescue the crew a few minutes before she sank.

Mr. HEPTON asked leave to state that the fishermen sailing from the Humber believed the Act referred to by Mr. Alward would be a special benefit to them. He knew the greater part of the Grimsby people were of this opinion, and a unanimous opinion in its favour prevailed in Hull.

Mr. ARNOLD (Kingsdown) said he had had to suffer enough through the loss of those nearest and dearest to him at sea, and if anything could be done to prevent it, he should be only too proud and happy to know it. They had heard about patent nets, patent lights, and other things, but he thought one of the first things was to bring more patent men in, but that was not to be done in a hurry, it required experience and education. Loss of life very often took place suddenly, without the least idea it was going to occur. He had often had to witness disaster, and to endeavour to assist in the saving of life, and he believed loss of life often occurred through the emulation of the men. One man would say, we can hang on to our gear as long as our neighbours, and therefore they would let it go a little while longer; but by-and-bye the time came when they were obliged to let go the gear, and sometimes perhaps it would be too late. But if the gear were let go they would not get so many fish; and if another man hung on and saw the gale out, the first man would be told by the owners, "Why did you not hang on longer; you could hold on as long as your neighbour." In old

times he remembered old people telling him that when it came to pay out the rope it was time to let the gear go, and the men would say, "We're going to take care of ourselves now, never mind the owners." But that was not the case now. They must look after those on shore, not after those at sea. But there ought to be a certain limit to that. He thought if there were better regulations, and every captain had a Board of Trade certificate, they might be trusted to say when it was time to let the gear go. At the same time, he would allow every man to know what his own ship would do best, whether it were a smack or a mackerel boat.

Captain SWINBURNE thought the general style of steam trawlers, judging by all the models he saw in the Exhibition, were nothing more than the old coast steamers with flat bottoms and flat sides, which was not at all the class of vessel for a steam trawler, and if they were continued there would be the same loss of life or more.

Mr. HELYARD said the class of steamers which they had had running for some eighteen years was not represented in the Exhibition at all. There was not a model like it.

Captain SWINBURNE said if they wanted to get proper fishermen, they must go back to the apprenticeship system. There was a great want of harbour accommodation on the east coast. He did not know what the Commission had said about it, but he knew several places where harbours were much wanted, such as Filey, Tees Bay, and Eyemouth. Vessels could always run there from a south-west gale.

Mr. HELYARD said some time ago he wrote a Paper on the apprenticeship system, which he sent to the late Mr. Buckland. He believed that system was gone, and ought

to go, as it would never do for the present age. He agreed with Mr. Alward that they must begin with education. Though he went to sea at thirteen, he ought not to have gone; and he might say another thing, that his apprenticeship never taught him his business; he learnt it and qualified himself almost in spite of the master he sailed with, and many a night he had taken his instrument and stolen upon deck to get an observation when he dare not let his master see him. His idea was, that there should be training homes for boys established either by Government or by individuals, where they could learn the first rudiments of seamanship, and let them take their certificate from there.

Mr. BLOOMFIELD said he could not allow this topic to pass without saying a word with reference to apprenticeship. It seemed to be the idea that Government were to take the matter in hand and make fishermen for the fishing fleet, but he had experience of what had been done for a great industry in the matter of apprenticeship. He had the honour of being the originator of the only china factory that ever existed in Ireland. When that commenced they had nothing but a lot of ragged urchins all round the village, and they were obliged to send over to this country for English and Scotch potters to commence. Fortunately his partner took up the question of apprenticeship, and they had forty-five or fifty of these ragged urchins, who began by simply turning the jigger, but in two or three years they learnt the business, and now you could go into that village and see those same ragged urchins wearing fine broadcloth, and earning from £2 to £3 a week. If they attempted to take it out of the hands of the fishermen themselves, the end would be that the glorious tribe of fishermen must degenerate into a lot of

people all looking at each other, to see what help they could get from someone else.

Mr. ALWARD said he understood Captain Swinburne to say that steam-trawlers were unsuited for the purpose, and were likely to be the means of loss of life. If that got into print it would be a great reflection on a class of vessels which they held to be second to nothing afloat as a means of catching deep-sea fish. He was quite ready to discuss the question on the ground of stability, buoyancy, or any other quality which a sea-going vessel ought to propose.

Admiral MACDONALD said he had been engaged a great many years in the preservation of life in connection with the Life-Boat Institution, and he did not like the discussion to close without a few words with reference to a class which appeared not to have been thought of except in connection with Captain Read's lights—he referred to sailors. They had been talking about saving fishermen, but sailors also needed assistance, and the Exhibition had done the best it could to help in that direction. Not only were prizes offered for all kinds of things for saving fishermen's lives, and fishing gear, but also for the benefit of sailors who went a little further afloat. There was a class of life-boats which went from the shore, and there were also ship's life-boats, and several of these had been examined, but the jury were not able to pronounce an opinion upon them, because they could not do so in a building. He only mentioned this lest people should imagine that only one class of life-boat had been considered. When on the coast of Scotland many years ago, he had occasion to bring life-belts in fishing-boats before the Cellardyke fishermen, and one of them said, It is really no use taking life-belts in our boat, because the only time when any danger happens is when we are running in from the banks, and then they

would be of no use ; but he told them that even if the boat did founder, and there was no chance of their lives being saved, it would give them time to offer up a prayer to Almighty God, and he believed that many of them did take life-belts with them ; whether they put them on he could not say. There was no doubt they were fearless enough, but they feared the chaff much more than actual danger.

Mr. TAMLIN said one of the great means of saving life at sea would be to support compulsory pilotage throughout the kingdom. At ports where compulsory pilotage was in existence, the pilots were in turn always at sea, no matter what the weather was, and hence they were on the spot ready to give assistance to ships in difficulty.

Mr. ROGER MOORE said, as a member of the British Town Council, he might mention that attention had lately been drawn to compulsory pilotage in the Bristol Channel. He had been elected a member of the sub-committee to deal with the question, and the belief of the majority of those mixed up with the seafaring population was, that if the compulsory district were limited to between the Homes and Kingroad, it would increase the dangers of the channel, and consequently the loss of life and property.

(The resolution was then put and carried unanimously.)

The CHAIRMAN said the last subject on the agenda was the question of fishing-vessels' lights. He thought really it had better be postponed as there was not time to consider it. He should be obliged to speak at considerable length upon it, because it was a question which he had gone into from the very commencement.

Mr. LIGGINS suggested that the Conference might be adjourned to some future day when the subject might be further discussed. He knew the Society of Arts had a

committee formed to go into any plan for the prevention of collisions during fogs, and these other subjects might be considered with it.

The CHAIRMAN said they might consider the Conference adjourned.

Mr. JEX said several fishermen of Yarmouth and of Scotland had asked him to lay before the Committee the impossibility of their attending this Conference, and asked him to ask the Executive Committee if they would obtain permission from the Fishmongers' Company for the use of their hall in January, when these practical matters might be further discussed.

Mr. BLOOMFIELD said the functions of the Chairman and Executive Committee would soon be at an end ; and he suggested it would be better to leave it for the Fishmongers' Company to take up the matter and issue their own invitations.

The CHAIRMAN thought it would be better to simply adjourn the Conference. Of course due notice would be given of any future meeting.

Mr. ALWARD then moved a vote of thanks to the Chairman for the grand services he had rendered to the cause. No doubt the Exhibition itself was due in a great measure to his exertions. He only wished he could say half he felt on this subject.

Mr. JEX seconded the motion, which was carried unanimously.

The CHAIRMAN said he was extremely obliged to Mr. Alward and Mr. Jex for the kind expressions they had made use of, and he could assure all present that it had given him the greatest pleasure possible to preside at these Conferences. He considered that yesterday and to-day had been two of the most important days' work in connec-

tion with the Conferences, and also the most interesting ; and he might also remark that, except the first two days, they had had the best attendances. As to the question of future Conferences, he would venture to suggest, and he should be glad to take any steps to follow up the suggestion if desirable, that there should not be simply an adjourned Conference, but that they should try to have in London every year a Conference of fishermen ; they would then hear, from representatives from all parts of the kingdom, their views on all the questions of the day. Every other interest met more or less annually in London, and he did not see why the fishing interest should not have a fair chance also.

THE
SCIENTIFIC RESULTS
OF THE
EXHIBITION.

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CONFERENCE ON FRIDAY, JULY 20, 1883.

HIS GRACE THE DUKE OF ARGYLL IN THE CHAIR.

THE SCIENTIFIC RESULTS OF THE
EXHIBITION.

THE text which has been selected for the Paper which I have the honour to submit on the present occasion has caused me no little perplexity on account of its ambiguity.

It has been pointed out to me that it is unwise to prophesy unless you know, and that no one at present can know what may be the results, scientific or otherwise, of the great Exhibition, which has still some months of its career to run.

Again, it is apparent that the word "scientific" has a very wide scope, including statistical, mechanical, hydrographical, biological and sociological results, all of which are in some way or other to be observed and studied in the great International Fisheries Exhibition.

The comprehensive vagueness of the title of my discourse has consequently the advantage that it permits me to choose from a very wide range of subjects, and I have accordingly to submit to you the following as a more exact definition of the matter to which I desire to call your attention. I propose not to speak so much of scientific

results which may flow from the Exhibition, as of scientific results which are illustrated in the Exhibition, and in particular of those results of the science of *Zoology* which are of importance to the Fish Industry, and are more or less completely set forth for our instruction and edification in the collections which have been brought together in the London International Fisheries Exhibition.

It would have been a congenial task to me to describe here some of the rare specimens of great interest to the zoologist, which have been sent by foreign countries to this exhibition. Such specimens as Nordenskjold's *Rhytina* and the magnificent skeletons of Ziphioid Whales shown in the Swedish court are of surpassing interest and importance from the zoological point of view. At the same time it must be admitted that they do not have any special importance in relation to Fisheries, and accordingly I must leave unnoticed such rarities and delights of the zoologist, in order to address myself more especially to the question of the relationship of the science of zoology to the fish industry.

The value of zoological science in relation to fisheries is not, I think, so fully appreciated in this country as is desirable in the interests of the public, and of those who make profit by enterprise in fisheries.

There is a very general tendency among men whose occupations are of a commercial character to undervalue the work of scientific inquiry, not only in regard to such matters as fisheries and fish-culture, but also in relation to manufacturing industries, agriculture, mining, and even in relation to medicine. To a large extent this arises from a misconception as to the real nature and character of what is called "science." Science is the knowledge of causes; its method and purpose when strictly pursued lead to the

accumulation and arrangement of thorough and accurate knowledge of any given subject to which it may be applied, with a certainty and an abundance which no other method and no other purpose can give. Undoubtedly the latest scientific knowledge of a subject is very usually not *immediately* useful to those who are engaged in applying commercial enterprise to the same subject. It is however to be noted, over and over again, that the scientific discovery of one generation becomes the necessary foundation of some valuable commercial enterprise in the next : what was at one time a curiosity and of little interest, save to men of science, becomes after fifty years the pivot of some great industrial manufacture.

Accordingly commercial men, and those who place the material well-being of this country beyond all things as an object to be continually striven for, should have patience in the presence of what seem to be the useless accumulations of knowledge ; they should have faith in the ultimate utility of science, for already throughout the length and breadth of the land this cause-reaching knowledge, which we call "science," has proved its enormous power of aiding commerce, and has amply established its claim not merely to toleration but to eager and generous support from those who are reaping golden harvests through the science of a past generation.

When we remember that science is really no more nor less than such accurate and full knowledge of this or that class of natural things as enables us actually to understand "the causes of things," then it becomes obvious that the distinction which is sometimes drawn between the "scientific" man and the "practical" man is founded upon some kind of error. If there is the antithesis which fashion causes many persons to assert as existing, let us see what

becomes of it when we say, as we are justified in saying, that the scientific man is the man who knows thoroughly and accurately. The contrast insisted on between the scientific and practical man becomes, then, simply the contrast between the man who knows and the man who does not know, but acts in ignorance.

As a matter of fact there is no such antithesis. Your man of science is, or should be from the nature of his pursuits, more thoroughly practical than any one who affects to despise scientific knowledge, for he is accustomed to insure success in his experiments and investigations by taking every means in his power to that end ; above all, and chiefly, by guiding himself by reasonings based on the most accurate and extensive knowledge. So too, indeed, every so-called practical man who is not a mere adventurer—a happy-go-lucky tempter of Fortune—makes use of accurate knowledge to aid him in his commercial ventures and speculations ; so far as he can get it, he makes use of science, though he often calls it by some other name as soon as it becomes useful knowledge.

The fact is, that a large part of the indifference to science in this country, and the notion that science is dreamy, vague, untrustworthy and useless to practical men, has arisen from the fact that these worthy practical men have very often allowed themselves to be imposed upon by mere quacks and pretenders, who assume the language and authority of science without any credentials whatever, and lead the practical men astray. Such quackery in science has been by no means unusual in this country, owing to the almost complete destitution of the wealthy classes in respect of scientific education. Practical men have, as a rule, not even a smattering of scientific training, and cannot distinguish true from false science, cannot tell which is the

quack and which the man of real knowledge. Equally unfortunate in this respect, in former times, have been the members of the executive and deliberative branches of our successive governments, so that—in days which we may hope are past—ignorant pretenders to scientific knowledge have been, in good faith, placed in responsible positions, and have helped to justify the notion that modern science is a wind-bag of theories, and of little use to the practical man.

Such causes—namely a general mistrust of so-called science, and to a small extent a painful experience in especial connection with fisheries, of the results of placing confidence in quacks who have falsely pretended to scientific knowledge—seem to me to be accountable for the fact that in the British Islands, neither publicly nor privately, has there been any attempt to make use of the services of scientific men in relation to our fisheries. The recent appointment of the distinguished naturalist who is at present Inspector of Salmon Fisheries, is evidence of a new disposition to seek the aid of the highest authorities in science in connection with this subject; but it must be remembered that salmon fisheries form but a very small part of British fisheries in their entirety, and that a large staff of experienced naturalists would be required to deal satisfactorily, within a reasonable time, with the many important problems presented by the British Sea Fisheries.

The Governments of some foreign States, notably of France, but also on a smaller scale of Norway and Sweden, Holland, Prussia, Saxony, and in a special, and in many respects very noteworthy, manner, that of the United States of America, have concerned themselves to obtain the aid of zoologists in developing and managing the resources of the fish industries of their respective territories.

results of the application of accurate knowledge concerning fishes, and such shell-fish as oysters, mussels, pearl-mussels, lobsters and cray-fishes, have been in some cases strikingly successful; in other cases time has yet to show what advantages may result from the attempts which have been made. In all these countries, however, one very distinct result of the appreciation of the possible value of scientific knowledge of fishes and shell-fish by the State authorities has been this, namely, that zoologists are occupying themselves independently, and with increasing earnestness, with the investigation of all that relates to the life and growth, the food and the enemies, of the marine and freshwater organisms which form the material basis of fisheries.

In the present Exhibition, accordingly, we see not a few of these scientific results exhibited in the courts assigned to foreign exhibitors; whilst, on the other hand, in the British department there is very little which comes under the head of zoological science at all, that is to say, which illustrates the results of exact inquiry into the natural history of the fishes and other animals which are such an immense source of wealth and industry to our seafaring population.

Before proceeding to enumerate and describe these scientific collections, I should wish briefly to explain in what ways it seems probable that the accurate knowledge with regard to fishes which is now being accumulated by zoologists may hereafter be useful in the regulation and management of fisheries.

In any given area of land or water, under natural conditions, where animals can obtain nourishment, there is found living (taking one year with another) fully as much animal life as can there nourish and reproduce itself. Practically the whole of the earth's surface and of the sea

is fully taken up by plants and animals. Many thousands more of most kinds are annually born than can possibly survive to maturity. The number of each kind of animal in natural conditions does not increase ; but there is a strict balance maintained, so that, with local exceptions here and there, those that survive to maturity in the struggle for existence merely replace those which have gone before. Many thousands of young perish, serving as nourishment for other lower and higher organisms, whilst the total number of mature organisms remains the same.

Take as an example the microcosm constituted by a pond in which carp are cultivated, as in Germany, where these fish are valued as food.¹ Such a pond is allowed to remain dry every fourth year, when it is cleansed and puddled. Water is then allowed to run in, and a given number of one-year-old carp are placed in it. After three years these are taken out and sold as food. In one such pond 30,000 young carp have been observed constantly to yield at the end of three years 20,000 kilogrammes of marketable carp ; when more than 30,000 young carp have been placed in the pond, no greater yield has resulted, 20,000 kilos. weight of carp-fish is the result of that pond's activity after three years. The food of the carp consists of delicate vegetable growths, of insects, and other minute aquatic animals. These hatch from eggs and spores introduced with the water into the pond, and the pond will only carry such an amount of this food as will in three seasons produce 20,000 kilos. of carp-flesh. It is further found necessary to keep with these carp in the same pond a few pike, which prey upon the carp to a certain extent. The carp-culturists know how many pike to introduce. A few act beneficially in destroying the smaller and more

¹ I borrow this illustration from Professor Möbins of Kiel.

sickly individuals of the carp-stock, and so prevent valuable vegetable and insect-food from being consumed by individuals who would either not survive for the three years, or would show no growth proportionate to their consumption of food. On the other hand, too large a number of pike would reduce the total weight of carp, and leave much of the minute food in the pond unconsumed, whilst a large portion of it would have been converted into pike-flesh instead of remaining as carp.

In the limited area of the carp-pond there are a great number of processes going on, which contribute to the ultimate production of the 20,000 kilos. of carp-flesh. The minute vegetable organisms are continually feeding on the carbonic acid absorbed by the water from the atmosphere, and on the nitrogen partly existing originally as nitrates and ammonia therein, partly returned to the water by the excretion and decay of its animal inhabitants. Minute worms and crustacea are feeding on these plants, and other larger insects are feeding on these ; finally, the carp nourish themselves on all these living things, and are to some extent preyed upon by the pike. Definite physical conditions, such as the presence or absence of a stream in the pond, the extreme heat and cold of summer and winter, and the presence of saline constituents in the water, determine the excess or the absence of one or another of the lower forms. If only *one* of these conditions be varied, the whole balance may be upset. An excessive growth of some minute plant, such as an *Oscillatoria*, favoured by heat or by the destruction of some other organism, may lead to the destruction of the proper food of the carp, and the yield of the pond may be endangered. The whole of these circumstances can, in the case of the carp-pond, be studied and controlled.

If we now pass to the consideration of any given area of the sea-bottom, we find that, though the area is not definitely limited, the same interaction of the various organisms inhabiting it, holds good. One form is preying upon another, and determining by its presence the numbers and the interaction of all the others. Physical conditions which affect one form, may in the same way, as in the carp-pond, affect the prosperity and abundance of another form. Currents, varying seasons, and such-like conditions, must obviously produce their effect. But still more influential must be the operations of man in removing a large number of edible fish from such an area. It is a mistake to suppose that the whole ocean is practically one vast store-house, and that the place of the fish removed on a particular fishing-ground is immediately taken by some of the grand total of fish, which are so numerous in comparison with man's depredations as to make his operations in this respect insignificant. Even were it proved that there is this sort of cosmopolitan solidarity about such fish as the Cod, which live in deep water, there is, on the contrary, evidence that shoal fish, like Herrings, Mackerel and Pilchard, and ground-fish, such as Soles and other flat-fishes, are really localised. If man removes a large proportion of these fish from the areas which they inhabit, the natural balance is upset, and chiefly in so far as the production of young fish is concerned. It is true that several thousand young are produced by each pair of fish left in the breeding area, and it might be argued that since, in the absence of man, only two out of the many thousand born of each pair of fish come to maturity and breed again in their turn, the only result of man's depredations (in addition to the depredations of other enemies) is to make way for more of the young, and to enable *more* than two of

the many thousands born of each pair in a preceding generation to survive and breed in their turn. This argument is at once seen to be fallacious when we remember that the thousands of *apparently* superfluous young produced by fishes are not really superfluous, but have a perfectly definite place in the complex interaction of the living beings within their area. These very young fish serve as food to other forms, which in their turn are fed upon by others, and are so interwoven with the necessities and conditions of life of other inhabitants of the area, that to remove, say something like a fifth or even a tenth of them from that area by removing the parent fish, must cause a serious disturbance in the vital balance of that area. When the fisherman removes a large proportion of soles from a given area, and so reduces the number of young soles born in the same season in that area, he does not simultaneously destroy the natural enemies of the young soles : consequently very nearly the same number of young soles are destroyed by such natural enemies as were so destroyed before man interfered, although very many less young soles are produced. It is thus quite clear that there is in reality no reserve stock of young to take the place of the adults removed by the special interference of man. The increasing scarcity of the sole is a serious fact, and is thus to be explained.

From this point of view it is clearly important, if we wish to keep up the number of food-fishes in an area which is fished by man, or to increase that number, that we should (1) either know what are the natural enemies of the food-fish in question at various stages of its growth, and seek to destroy those enemies in proportion as we remove the adult fish ; (2) or, again, that we should isolate and protect the young fish from these natural enemies for a part of their

lives; (3) or, lastly, that we should, in proportion as we remove breeding fish from the area, artificially introduce into that area eggs, or young fish hatched under supervision, so as to supply the deficit created by the fishery of egg-producing adults.

Any of these operations requires very considerable and most accurate zoological knowledge, and it would be madness to attempt to carry any of them out by proceeding upon hasty guesses or suppositions as to the habits and life-history of the animals concerned.

There is also no doubt that certain modes of fishing and seasons of fishing may be more destructive, more disturbing to the balance of life in a given area, than other modes and other seasons of fishing. The food of the fish which are valued, may be destroyed by some of man's operations, their enemies may be unwittingly encouraged by others. Legislation is continually demanded, and has been from time to time carried out, in reference to such matters as modes and seasons of fishing and pollution of waters. But it is undeniably true that, in most cases, the accurate knowledge as to the life-history and circumstances of fishes is too small to justify legislative interference. No doubt zoologists have suggested some valuable restrictions which have been adopted by the Legislature in regard to some fisheries, and it is to Linnæus, the great Swedish zoologist of the last century, that Sweden owes important fishery laws. But if we are to have effective legislation at the present day in regard to our sea fisheries—we must, before proceeding any further, have *more knowledge*. Those (and there are many) who earnestly desire additional restrictive Fishery Laws should do their utmost to enable zoologists to carry on researches which will provide that accurate knowledge of fishes and shell-fish, their food, reproduction

and conditions of life—which must be obtained before legislation can reasonably be proposed.

The only mode of deciding between the conflicting opinions which have so often been expressed during this Congress, as to the necessity of this or that legislative enactment, is by bringing new knowledge to bear upon the questions at issue. That new knowledge is nothing more nor less than a part of Zoological Science, and can only be obtained through the exertions of those who are already acquainted with the actual condition of that science, and with its methods of minute and thorough investigation.

It is apparent, then, that the results of zoological science as they may possibly effect fisheries, must even at the present moment be very considerable. We may classify them as follows :

1st. The discrimination and classification of the different kinds of plants and animals, including the fishes themselves which inhabit the various fresh and sea waters where fisheries are carried on. This is what is known as the study of Systematic Zoology, and of the fauna and flora of districts.

2nd. The knowledge of the successive phases of development or growth from the egg, and of the internal anatomy and mechanism of life of the chief forms of such animals and plants. This constitutes what is known as General Morphology and Physiology.

3rd. A specially detailed knowledge of the life-history of those species of fishes, molluscs, and crustacea, which are valuable to man and are the subject of fisheries; a knowledge of their migrations, susceptibility to external influences, of their food and its history in detail; of their enemies, in the shape of other fishes, birds, whales, seals, and insects &c., which prey upon them and their young;

a knowledge of their parasites, injurious or harmless, and of their diseases. Such knowledge may be termed the Special Biology of Economic Fishes.

4th. A knowledge of those particular features in the life-history of an economic fish or mollusc, which directly concern the work of the fisherman or the fish culturist; a knowledge of the effects produced by particular fishing operations, as shown by statistics, or of the effects produced by particular methods of preservation and culture: further, a special knowledge of those parts or qualities in economic fishes or molluscs which are of commercial value, and a knowledge of methods of improving or securing those parts or qualities. This group of topics constitutes what may be called Pisciculture.

Coming under the first head—of Systematic Zoology—there are some valuable collections in the present Exhibition, but on account of the large space which they would occupy were they complete, such collections are, on the whole, rather samples of larger collections than attempts at complete illustration of the marine or fresh-water inhabitants of a district. Thus, Dr. Dohrn of Naples has sent a series of about 400 bottles containing specimens in a marvellous state of preservation, accurately named, of the fishes, crustacea, molluscs, annelids, star-fishes, corals and jelly-fish of the Bay of Naples. Mr. Oscar Dickson sends also a very beautiful collection of named specimens from the Gothenburg Museum, illustrating the fauna of the neighbouring sea. Professor Lilljeborg exhibits in the Swedish department a very large scientifically named collection of the crustacea which form the food of many fishes in the great fresh-water lakes of Northern Europe. He has especially occupied himself with the study of these organisms, and has discovered many new species; it is

worthy of remark that English naturalists only two years ago became alive to the fact that the same fresh-water crustacea exist in the English and Scotch lakes. It is quite possible that a proper knowledge of these crustacea may at some future day be of value in attempts to cultivate fish in British lakes. Marine birds and mammals are exhibited in various parts of the Exhibition. Dr. Francis Day exhibits his great collection of Indian Fishes—preserved in spirits and accompanied by the coloured plates, of his great book on Indian Ichthyology : he also exhibits a collection of British fishes carefully preserved and named. The American department is remarkable for the carefully coloured series of casts, representing different species of the American food-fishes, and for samples of the animals of lower classes obtained from considerable depths off the American coast. Complete collections of the edible crustacea and mollusca of the United States, and of the commercial sponges of the coast of Florida, are also exhibited.

Under the second head—viz. General Morphology and Physiology—there is very little to be noted in the Exhibition. In fact, when we have mentioned the series exhibiting the growth of the salmon from the egg onwards, exhibited by Professor McIntosh of St. Andrews, and the series of flat fishes of various ages in Mr. Oscar Dickson's collection—there is nothing except the valuable drawings of the anatomy of the oyster, and of its development from the egg, exhibited by the Netherlands Society of Zoologists. Under the auspices of this Society, which possesses a movable house fitted as a zoological laboratory, which can be erected for temporary use on any part of the Dutch coast—two Dutch naturalists, Dr. Hoek and Dr. Horst, have within the past two years made some careful studies of the oyster which have very greatly added to our know-

ledge of that important mollusc, and may eventually be of service to the oyster-culturist. The results obtained by these observers are shown by large coloured drawings exhibited in the Netherlands department.

Some results of zoological science coming under the third head, viz. Special Biology of Economic Fishes, are to be found scattered here and there in the Exhibition. Collections of insects injurious to fish or to their eggs and young, are exhibited in the Swedish Court, also, in a small way, in the American Court. A few parasites of fishes are exhibited by Dr. Cobbold, in the Eastern Arcade, and a remarkable series of the crustacean parasites, or fish-lice, of the fishes of Trieste is shown by Dr. Antonio Valli in the Austro-Hungarian section. Fish diseases are represented by stuffed specimens of salmon, with cotton wool attached, indicating the position of the growths of *Saprolegnia* which cause the malady.

The fourth section into which we have divided the results of zoological science, as seen in the Exhibition—namely that of the various developments of pisciculture—is richly represented by the exhibits of English oyster-culturists and salmon farmers; but in the most interesting way in the American department, where the devices made use of for hatching the eggs of sea-fish are shown. I need hardly say that the artificial hatching of the eggs of sea-fish is a novelty, and distinctly a result of the application of scientific knowledge. Since the culture of marine and of fresh-water fishes has formed the subjects of special papers at this Congress, I will not venture to say anything further about it here beyond claiming it as a scientific result.

There appears to be no exhibit in the building relating to the Pearl fisheries, either marine or freshwater; in relation to these we should anticipate that the application

of scientific knowledge might produce some very definite results (in the way of pearl-production).

Sponge fisheries are represented by collections of sponges from Florida, from the Bahamas, and from the Greek Islands. In the collection from Florida is a specimen having a very definite scientific interest. It represents an attempt at sponge-culture. Some years since in the Adriatic—under the Austrian Government—Professor Oscar Schmidt made some experiments on the propagation of sponges by cuttings. It was found possible to cut a live sponge into pieces, and affix these pieces each to a separate slate by thread, when each piece would attach itself to its slate and continue to grow. In this way sponges can be transported from one area to another—but the total weight of sponge is not increased, for the pieces of the divided sponge only produce the same amount of new sponge as they would have done had they never been separated from one another.

It appears that sponge-cutting is being attempted on the Florida coast, and in the American Court are two sticks with sponge-cuttings growing upon them, which have been artificially placed there. I am not aware as to whether any valuable result has been obtained by thus cutting the sponges ; but it is certain that they might be thus introduced into artificial basins, and grown there, were the general conditions in such basins favourable.

Coral fishery is represented by an exhibit from Naples, and by three pieces of valuable red coral from Japan which have been purchased for commercial purposes at a high price. The eminent French zoologist, Lacaze Duthiers, under the direction of the French Government, made a very thorough study of red coral, and obtained scientific results of great importance, fitted to assist the coral fishermen in the regulation of their fisheries and the culture of coral ; but

these results are not in any way illustrated in the present Exhibition.

On the whole, it appears when one attempts to enumerate the results of zoological science in relation to fisheries—illustrated in the present Exhibition—that there are but few results which are so illustrated—in fact not nearly so many as one might have expected. But, on reflection, it will appear that it is difficult to show, in the form of a tangible exhibit, many of these results. They are for the most part to be found in books, and in the memoirs and illustrative drawings published by scientific societies. Microscopic preparations, showing every detail of the growth from the egg—of the oyster, the mussel, the lobster, the sole, the cod, and salmon, are hardly to be looked for. Really complete zoological collections would be too cumbrous for transport and exposure in such an Exhibition. But above all it is true that many of the most important scientific conclusions affecting the interests of fisheries are not capable of exhibition. The instruments with which the investigations are made, and in some cases the animals which have been the subject of investigation, may be exhibited, but the scientific result can often only be *exhibited* in so far as it affects the procedure of fish-catchers, fish-breeders, or fish-culturists.

I think that it has been made very apparent, not only by the class of objects exhibited by foreign contributors to this Exhibition, but also by the original papers and the discussions which the Conferences connected with the Exhibition have produced, that there is nothing which is so much needed in connection with all kinds of fisheries, river or sea, shell-fish, true fish, coral or sponge—as more knowledge, more science—in fact, more zoology; and not only that, but that there is nothing which is more desired

and recognised as needful *by all those who are best informed in their own particular branches of fishery.*

Improved machines for catching fish, new legislative restrictions, State aid to fisher-folk—all such desiderata are, I believe, admitted to be less urgently needed, less likely to prevent our various fisheries from deteriorating or disappearing altogether, than the one desideratum—more accurate knowledge.

It is admitted on all sides that many British fisheries are suffering, or are in a precarious state—others are actually destroyed. It is also admitted that our only chance of bettering this state of things is an increase of scientific or accurate knowledge.

If this is the case, there will be one grand scientific result of the International Fisheries Exhibition, and that will be an increased attention to, and adequate provision for, the carrying on of zoological studies in relation to fishery-animals.

I can picture to myself the shape which this scientific result might take, and I should be very glad were it to commend itself to the many influential men connected with fisheries who have organised this Exhibition, and will have the direction of its final outcome.

If it is demanded that more accurate knowledge of fishery-animals shall be provided for the public use, then arrangements must be made to enable skilled zoologists to carry on the investigations required. To make such investigations, continuous residence for weeks or months at a time, by the sea-shore, is necessary. In France, Holland, Italy and the United States, sea-side laboratories have been constructed, which are provided with working tables, glass apparatus, aquariums, &c., and a staff of attendants and fishermen—to which naturalists can resort who desire to

carry on investigations upon the life-history of marine organisms. Very valuable researches have been made through the agency of these institutions, and there can be no question as to the facilities which they afford, and the inducement which their existence offers, to naturalists to occupy themselves with these particular studies.

By offering free accommodation in such a laboratory to competent investigators you may obtain a large amount of valuable results at a minimum of expenditure. In any such laboratory there would probably be one or two permanent officials who would be competent zoologists, charged with special subjects of investigation and receiving salaries—but in addition to these, the laboratory would throw open its resources to voluntary workers (as do the foreign laboratories of which I have spoken) and thus the working power and the general interest of the scientific world in these institutions and their work would be enormously increased.

I can imagine a National Fisheries Society or Association, such as may come into existence in connection with this Exhibition, building such a laboratory for the study of marine zoology in relation to fisheries, somewhere on the coast not too distant from London. Such a laboratory would stand near the shore, possess its own jetty and small harbour, with steam-launch for dredging and trawling, and other boats. Adjacent to it would be marine ponds for experiments in the culture of oysters, mussels, and whelks, and of various fish. The director of the laboratory and his assistant would be provided with houses forming part of the laboratory building. The basement of the laboratory would consist of large well-paved rooms fitted with tanks, and an apparatus for the circulation of sea-water. Here animals would be kept for observation, and the

produce of a day's dredging or trawling would here be sifted and sorted. On the ground-floor and first-floor would be spacious rooms, with large windows giving both north and south lights, and fitted with tables suited to the requirements of the microscopist. Small aquariums and pumping apparatus would also be provided in these rooms. Accommodation for ten workers, in addition to the director and his assistant, would thus be provided. In another room a complete zoological and piscicultural library would be established, and the means for writing and making drawings would be provided.

The naturalists permanently and temporarily working here would in the course of a few years provide us with much-needed knowledge. For instance, some would study the reproduction of the sole, and devise means for increasing its numbers in the market ; others would ascertain how best to deal with oysters ; others would find out the whole history of the mussel. Bit by bit a new and thorough knowledge of fishery-animals would be built up, and come into use as the basis of new legislative enactments, and of new methods of capture and culture.

Such an institution would no doubt be costly. A valuable laboratory of the kind might be set going and carried on for a smaller sum ; but a really creditable and efficient laboratory of the kind, with a first-rate man of science for its director, would cost £15,000 or £20,000 to establish, and some £3000 a year to maintain.

These figures and the whole suggestion may appear extravagant to some persons who are not aware of what has been done elsewhere.

The "Zoological Station" of Naples, founded and directed by Dr. Anton Dohrn, is no less costly and efficient an institution than that which I have briefly sketched. Else-

where, at Trieste, at Concarneau, at Roscoff, at Beaufort in North Carolina, less costly institutions have been set going, which are doing most valuable work.

The British coast is entirely destitute of any such home of research. No zoologists are employed by the Government or other authorities in this country to investigate our fishery-animals: those zoologists who do carry on such work on the coasts of this country, do so at their own expense. There is not even a laboratory, a boat or a dredging apparatus, provided by any public body to assist them. Naturally enough their work has not been hitherto specially directed to problems connected with fisheries; but it is only needful to offer to the many isolated investigators the use of a good laboratory and a well-considered organisation, in order to obtain through their co-operation the new knowledge which is so urgently needed.

I cannot but think that it will be a matter for profound congratulation to those who have brought this Exhibition into existence, to the Legislature, to men of science and to those concerned in fisheries, should we be able in future to point to a "National Laboratory of Marine Zoology" as THE Scientific Result of the London International Fisheries Exhibition.

DISCUSSION.

PROFESSOR BROWN GOODE proposed a vote of thanks to Professor Lankester for the masterly essay he had read. The results which should arise from the present Exhibition had interested him very much from the first time of its proposition, and on coming to England he had been much interested to see how the various journals were casting about to see what the results were to be. It was suggested that

the price of fish might be lowered, that many kinds of fish now not appreciated would come into favour, that the fishermen should get a larger share of profits and so on—each person seeming to have a special idea of his own; but Professor Lankester had really touched the core of the whole matter in showing that the chief results must be the scientific results. It seemed to him that the spread of actual scientific knowledge concerning fish and fisheries was one of the things which, above all others, would be the most profitable and satisfactory outcome of this Exhibition, and Professor Lankester had shown very clearly many of the ways in which that object might be attained. He had mentioned several important things, and amongst others he had called attention to the apparent opposition between scientific and practical men. The practical men had, he confessed, been rather an amusing feature of this Exhibition; some of them had stood on the platform and cried out against the views of men of science; but he thought any one who examined carefully the printed reports would find that the most practical papers had been those read by the scientific men, and that it was quite unnecessary for some of the “practical” men to disclaim scientific knowledge, because the lack of such knowledge was quite evident from the tenour of their remarks. Only the other day, however, he had the pleasure of listening to a paper by Mr. Cornish on the mackerel fisheries, which was an excellent example of the work of a man who has a thorough practical knowledge of the subject on which he spoke, and yet who in every sentence of his paper showed that his mind worked in a thoroughly scientific groove; he made his observations carefully and conscientiously, and from those observations deduced conclusions which were quite beyond criticism. Another important point, which the pre-

sent paper called attention to, was the thoroughly legitimate manner in which scientific men could apply a scientific method to practical subjects ; and on behalf of those in the United States who claimed to be zoologists, and who had at the same time been trying to work out practical problems, he thanked Professor Lankester for the endorsement which he, as an English man of science, had given to the opinion that scientific investigation was not necessarily disconnected with practical results. There were some amongst scientific men who rather looked down upon any investigation which had a practical result, but it seemed to him that such a course was quite untenable, and that "the pursuit of knowledge for its own sake" was thoroughly compatible with the consciousness that some of the human race were to derive from the effort immediate benefit. Professor Lankester had spoken of the literature arising from the Exhibition, and also of the influence of these Conferences, and he thought that point deserved to be brought out even more fully. There had certainly been some extremely original and valuable papers published ; and even the Catalogue itself, which Mr. Trendell had so admirably edited, contained many important scientific papers interspersed with its pages, and was a contribution of considerable importance to science. Some of the Papers read at those Conferences had been thoroughly original, and were worthy of publication in the memoirs of any scientific society ; and he would suggest that one of the most important scientific results of the Exhibition, if it could be secured, would be to have published officially a series of Papers, of which the one now under discussion might well form the first, in which the teachings of each section of the Exhibition should be pointed out by some man of science. This would be a permanent index to the

teaching of the Exhibition, and would, he thought, prove very valuable.

Professor HUBRECHT seconded the motion. He thought one lesson to be drawn from the paper they had heard, which must be taken as a motto, was more knowledge, more science, and more zoology. Professor Lankester had spoken with appreciation of the interest which the Government of the Netherlands appeared to take in science, and in that respect he thought they had nothing to complain of. On the other hand, the legislation with regard to sea fisheries, which had been discussed very much at those Conferences, had already gone a good way in a certain direction, and he feared had been rather premature, owing to sufficient feared he had been rather premature, owing to sufficient scientific knowledge not having been acquired before the laws in question were passed. There was a large portion of the German Ocean, running a considerable extent into the land, which was much used as a ground for the herring, anchovy and flat-fish fisheries ; but fishing there with certain nets and fishing gear of a certain kind had been prohibited. This legislation only took place a few years ago, on the proposal of certain towns and villages on the coast, which represented that their fisheries were diminishing, and that they were gradually being starved out by over-fishing. These laws had now been passed, and a large police force organised to see that they were carried out ; but the results had almost staggered some of those who were favourable to this legislation, and the question was whether they were to go on on the same principle. Their faith had been especially shaken by two things. First, the population, which principally subsisted on fisheries—who brought the young fry of the herring into the market and sold them to large establishments, where they were used for feeding ducks ;

which again produced eggs, which were brought into the market, and thus there was a conversion of the inorganic material which the sea produced into serviceable food for man—had now lost their means of livelihood. In the same way it was said that by trawling the ground the spawn of other fishes was greatly disturbed ; and an outcry was made against fish being used for manure, which had died in the nets and could not be used in any other way. It was said that if these young fish had not been caught, they would have grown up, and might have been captured hereafter, and served as food, but it was forgotten at the same time that when these young herrings had become adult, they might have swum away and come to the English, and so been caught by English fishermen. Secondly, there was an opinion, which had been openly avowed by some of the most eminent scientific authorities, that legislation with regard to sea fisheries ought not to be undertaken until the knowledge of the subject was more matured. This view was supported by the fact that, just before this law was enacted, after there had been years of the most destructive fishing going on, as it was said, there came a year in which the amount of fish taken was really marvellous. This legislation had now been going on for two or three years, and the results were so unsatisfactory to even those who were most in favour of it, especially those who were directly interested in the matter, that they were now thinking whether it would not be advisable to urge upon the Government a change in the legislation, as far as these sea fisheries were concerned. It did not follow at all from this that legislation should never be attempted, but only that it should not be undertaken without sufficient knowledge of the fish which inhabited the part of the ocean in question ; their habits, origin, and migrations ; the development of their eggs, and the

way in which this was interfered with by the fishing which was going on. He therefore endorsed from the bottom of his heart the principle for which Professor Lankester had contended, that there must be inquiry, and still further inquiry, before legislation based on scientific and accurate principles could be carried out.

(The resolution was then put and carried unanimously.)

The MARQUIS OF EXETER then proposed a vote of thanks to His Grace the Duke of Argyll for his kindness in coming to preside on this occasion.

MR. WALLEM seconded the motion, which was carried unanimously.

The CHAIRMAN, in responding, said he took a deep interest in the subject of the lecture, and it had been to him a great pleasure to hear so interesting and striking a Paper. It was so full of interest, that almost every sentence suggested matter for reflection. In the first place he thought Professor Lankester had been rather killing the slain when he inveighed against the objection taken by some practical men to purely scientific investigation. Some few years ago the fear might be entertained that this objection would place some obstacle in the way of science, but at present the applicability of science to the practical uses of life, and the immense advances which had been made in the applications of science, had particularly struck the public imagination and reason, and every one now but the most ignorant recognised the enormous value of science. The truth was, he had heard a serious complaint made that some of our most distinguished men of science had their time so occupied in patents, and directing the practical application of abstract science to the uses of life, that they had barely time for teaching pure science. At the same time they could never be too serious in the assertion of the principle that science pursued

truth for its own sake ; that scientific men delighted in the ascertainment of truth for its own sake ; and that they need care little or nothing for its future practical application. Professor Lankester had also said a few things in respect to Government which were no doubt to some extent true, but in regard to them also he would put in a word in favour of the class of public men to which he belonged. It had been said that Government in this country hardly ever consulted men of science. That might have been so in former times, but it was not so now ; for, with regard to this very matter of fisheries, it was not many years ago that the Government committed a most important investigation to the hands of his distinguished friend, Professor Huxley, as the head of a commission that went to Scotland to inquire into what was the practical application of the laws then in force for the regulations of that kind of fisheries, and on the report of that distinguished Professor, very considerable alterations were made in the laws then in force. Passing from this general point, he would say a word or two with regard to the question of legislation on fisheries. He had had considerable means of observation and experience with regard to the application of the former laws to the herring fisheries on the coast of Scotland, and he was bound to say that he agreed in the general conclusions of Professor Huxley, that they did not know quite enough of the life and habits of the herring, for instance, to be able with any satisfaction to make a close time, or to prohibit any particular mode of fishing. He happened to live on Loch Fyne, which was celebrated for herring ; it used to be the annual resort of enormous shoals of herrings, and under his own windows he had seen as many as 100 boats putting out to sea ; but, for the last twelve or fifteen years, herrings appeared to have deserted the upper reaches of Loch Fyne.

Amongst the fishermen it was the universal belief that this absence of the herring shoals was due entirely to a new mode of capture which had been practised to a very large extent, and which was there called trawling. It had nothing to do with what was called trawling in the south, which meant a net dragged along the bottom of the sea for flat fish; but trawling, as it was locally called, meant drawing a seine net, such as was used for the mackerel fishery on the coast of Cornwall. That was an entirely new mode of fishing for herring at that time in the west of Scotland. The old orthodox mode was what was called a hanging net, which was a very large net, hundreds of fathoms long, which hung like a wall in the water, and intercepted the shoals of herring, which at night swam against it, and got entangled in the meshes. There was no motion of the net, it was perfectly still in the water, and was taken up when it was felt by the fishermen to be full. The new mode of fishing was by drawing the net into the shore or a boat, and it was the fixed belief of the old fishermen that the mere fact of drawing the net through the water frightened the shoals, and prevented them coming up: it, as they called it, broke the shoals. There were consequently some severe laws passed against trawling, which were most difficult to enforce, because in a very intricate coast like that of the west coast of Scotland—and his own country had upwards of 2000 miles of coast—it would require an immense body of police to enforce such a law; because seine nets were easily got and easily hid, and, in short, the expense which would be incurred, and the bad feeling which would be raised in trying to enforce these laws, made it a serious question with the Government whether they should be continued or not. Professor Huxley's conclusion was that no particular mode of fishing had any effect on the shoals of herring, but that one was just as

injurious as the other ; and that it was no use to maintain these laws, and accordingly they had been repealed, and all modes of fishing were now free. He could not say that he had made up his mind on the question. Professor Huxley said that the enemies of the herring were so many, that the utmost number that man could take was as nothing to the number of herrings which were destroyed by their natural enemies. He had entered into various calculations with regard to the number of herrings eaten by every kind of fish, and by birds, especially by the gannet, which were more or less satisfactory, but he must say he had some misgivings as to the accuracy of those calculations. For example, he did not believe it to be true that the cod fish lived principally on herring. A cod fish, like himself, would always take a herring when he could get it, especially a Loch Fyne herring ; but he happened to know from his own experience that the cod fish of Loch Fyne, especially during the winter, did not feed on the herring, because he made it a practice to examine what they had been feeding on when taken, and could say, as a positive fact, that during the winter months he hardly found a herring in the stomach of a cod fish. They lived principally on crabs of various kinds, and to a large extent on a particular kind of star-fish, the ophiurus, which lived in muddy bottoms. He had found the stomach of a large cod filled with this apparently hard and innutritious substance. Then with regard to the gannet, a large bird of which he was particularly fond, he did not believe that he lived entirely on the herring. He had seen it diving in immense numbers on shoals which he had the best reason to believe were not herring at all, but the common coal fish, or pollock whiting. He, therefore, doubted much the data on which these calculations were made. Another thing with regard to the herring

was this. When there was a large mass of herrings in a shoal, there was no fish which would venture to the centre of that enormous legion. He did not know that he ever realised what a shoal of herrings was, though he had often seen the boats in Loch Fyne, until last year when he happened to go in his yacht to the head of Loch Hourn. Soon after they anchored to the head of the loch, they observed that the herring boats were coming up behind, and long before sunset the yacht was surrounded by several hundreds of boats. They soon had indications that the shoals were moving, and before sunset they began to see the fish jumping all round. The boats shot their nets, and within half-an-hour there was not one net that was not so full that they were sinking to the bottom. They rowed about during the night to see the men lifting the nets, and some were one solid mass of fish, so solid that four or six men were unable to lift the net, and in several cases he had to lend his own men to help them lift their nets into the boats. The next morning the whole fleet were going down to the lower reaches of the loch to get their fish salted, and some of them were level with the water, so that the slightest undulation would have sunk them, but fortunately the sea was very calm. The fishermen said, with regard to shoals of herring of that kind, there were no predaceous fish which would enter into the midst of them, that they would be suffocated and smothered by the mass of herring. Therefore he thought all these calculations were matters of extreme doubt. One of the greatest mysteries with regard to herrings was this: Loch Hourn was a long, narrow inlet into the mountains opening out on the island of Skye, but these shoals were never seen before they got into Loch Hourn. The question was, where did they come from? they must come from the open ocean somewhere, but they

were never seen until they got into the head-waters of the loch, where they were caught in large numbers, and the fishing lasted three or four months. Of all these matters they were absolutely ignorant. On land they could examine closely the habits of animals, their modes of propagation, and their food, and so on ; but with regard to fish, they could not go under the water, or follow them into their haunts, and they really did not know what their habits were. He was quite willing to admit that observations in an aquarium might be of the highest scientific value ; but he need hardly say that in an aquarium you could never get really into the secrets of the migratory habits, which was the important point with regard to such a fish as the herring. With regard to legislation, if it were the object to save the herring, a law should be passed to prevent the fry being caught ; and yet Professor Günther, one of the greatest authorities on fish in this country, declared that whitebait, one of the greatest luxuries of London, was nothing but young herring ; so that one of the most lucrative and popular fisheries on the coast near London was one which destroyed millions of fry of that invaluable fish, the herring, yet nobody proposed that this should be prohibited. One of the most interesting parts of the lecture was that which dealt with the cultivation of fresh fish. Naturally in this country, being an island, sea fish were principally thought of, salmon being almost the only great article of commerce in the way of fresh-water fish ; but Professor Lankester had pointed out that in other countries the cultivation of fresh water fish, as part of the food of the people, was an important item ; and he was never more struck with this than when going into the market place at Dresden and Munich, and some of those towns in Central Germany where the people had no access to sea fish, but where he

found the market quite full of very nutritious food derived from the ponds, lakes, and rivers of the country. He could not help hoping that, as one of the results of this Exhibition, people would undertake fish ponds, just as they undertook ponds for water-cress in the neighbourhood of London. Some ponds near London, not much larger than that room, yielded very large rents from the growth of water-cress, and he hoped that ponds would also be established for the sale of fresh-water fish, because carp, tench, and other fish might be grown to a very great extent. But then they would have to get over some popular prejudices which existed in the minds of the poor, though probably not so much in England as in Scotland. For example, eels were a very favourite food in London; but, in the west of Scotland, a Highlander would as soon think of eating a serpent as an eel; in fact, they thought they were serpents, and although they had lakes and ponds full of the finest eels, they would not touch them or look at them in the way of food. In the lagoons of Venice there was an enormous fishery of eels, which were sent all over Europe in a salted condition. With regard to the culture of trout, he did not suppose that would ever come to be such an important industry for the food of the poor as others might be; but there were some curious facts in regard to it, of which he was reminded by some observations in the paper. Professor Lankester had referred to crustacea, which was the food of fishes, and that was a subject very little known in this country. The peculiar red colour of salmon, which was the only fish, so far as he knew, in the world which had that colour, sharing it, of course, with other members of the salmonidæ and trout family, was, in the opinion of Professor Günther, owing to the peculiar crustacea that it ate. Almost all the crustacea, when

boiled, became of a very red colour, some a very brilliant red, and the same thing occurred when they were digested. If you took a crustacean, half digested, out of the stomach of a fish, you would almost always find it of a red colour; and Professor Günther said that it was this peculiar colouring matter which gave its richness to the salmon. There was this peculiar circumstance about the trout, that some lochs contained trout of a highly red colour. He knew some lochs in the Highlands of Scotland where the trout were very fine, and quite as red as salmon; but he had never been able to discover that there were any peculiar crustacea in those waters. In the case of other lochs on the same hill, not perhaps 200 yards off, the trout were white, and in very inferior condition. These were points of extreme interest which might be scientifically investigated. Now the suggestion made by Professor Lankester, and he suspected the whole of his paper led up to this, was that the Government of this country did too little in these matters, and he was quite willing to plead guilty that the Government had done far too little for science. The system in England was for everything to be done by private enterprise, and hitherto it had been relied upon almost entirely. It was true we had our national geological surveys, but not even those were conducted on the scale which they were by the Government of the United States, whose splendid publications they were sometimes good enough to send him, illustrated by every species of drawing and section. He thought we did too little in the matter; but it was not very easy to know exactly where to begin. Professor Lankester had made a practical suggestion, which he said had been warmly taken up by some of the most distinguished men of science; Sir John Lubbock, Professors Sclater, Michael Foster, Burdon-Sanderson, Flower,

Romanes, Sedgwick, Mosely, Milnes-Marshall, Thistleton-Dyer and Allman, and their recommendation was that a scientific observatory should be set up; a scientific aquarium, with fully equipped rooms for investigation and dissection of all kinds, as it had been at Naples, at the expense of the Government, for scientific investigation of the life of fishes. This was a most important suggestion which he hoped would be brought before the Government, with all the influence and authority which these great names would undoubtedly carry with them. How far it was likely to be accepted he could not say, not being a member of the Government; but he should be very glad to give any help he could in the matter. He understood that the establishment at Naples, which had produced very valuable results, was set up, not by the Neapolitan or Italian Government, but by several Governments in Europe combining. He did not know why they should have fixed on the Mediterranean for such a purpose, because the fauna of the Mediterranean was essentially different from the fauna of the Atlantic and the Northern seas, and observations made there, although they might be of use for the Mediterranean, were not likely to be of such practical value as observations made on the fishes of our own shores. He believed to some extent the establishment at Naples paid its own way, because tables were hired out to various scientific persons, who came from all parts of Europe and hired a table and tank for the investigation of particular phenomena. It was quite possible that such an establishment might be set up in this country, and that after all the ultimate cost to the Government might not be very large. He was sorry to detain the meeting so long, but he could not allow this interesting lecture to pass without saying something upon

it, and he heartily concurred in the vote of thanks which had been passed to Professor Lankester.

The document referred to by the Duke of Argyll is as follows—

“ PROPOSAL FOR THE FOUNDATION OF AN OBSERVATORY ON THE BRITISH COAST FOR THE STUDY OF MARINE ANIMALS AND PLANTS IN RELATION TO FISH AND FISHERIES.

“The value to the FISH INDUSTRY of an increased knowledge of the habits and life-history of Fishes, has been proved by the experience of the American and French commissions. Without such knowledge we cannot improve our Fisheries commercially ; with it, there is every probability that a great deal may be done in the way of controlling and extending them.

“ In order to gain accurate knowledge as to the circumstances which affect the life of fishes, and the various molluscs, shell-fishes, corals and sponges, which are IMPORTANT COMMERCIALLY as well as interesting from the scientific point of view, it is necessary that continuous observations should be made upon their growth from the egg onwards, upon their food and its natural history, as well as upon their enemies and the conditions favouring, or injurious to, their life.

“ Such observations can only be successfully carried out by persons resident on the sea-coast.

“ In order to enable competent observers to spend such time as they can afford for these studies to the greatest advantage, Zoological Observatories have been established on the sea-coast of foreign countries, but at present there is no such observatory on the British coast.

“ The first observatory of the kind is ‘the Zoological

Station' established by Dr. Dohrn at Naples, which is frequented by naturalists from all parts of Europe. Its buildings and aquaria represent an expenditure of £20,000, and its annual expenditure is over £4000.

"Similar observatories have been established by the Austrian government at Trieste, and by the French government at Concarneau, Roscoff and Villefranche.

"It has been for some years the desire of English naturalists to establish a zoological observatory on the British coast, which would be in charge of a competent resident superintendent, and fitted with aquaria, laboratories, and apparatus, and possessed of boats and dredging apparatus. Two or three fishermen would be kept in the pay of the observatory. The institution thus organised would be frequented at all times of the year by naturalists desirous of carrying on original investigations relative to the life-history and structure of marine organisms. Accommodation for as many as six such naturalists might be provided.

"The affairs of the observatory and the granting of permission to make use of its appliances might be entrusted to a small committee consisting (for example) in the first place of the Warden of the Fishmongers' Company, the Professors of Zoology, Botany and Physiology in the Universities of Great Britain and in the London Colleges, and the Secretaries of the Linnean and Zoological Societies of London.

"Were such an observatory once established there is every reason to believe that funds could be raised annually for the purpose of extending its operations and of carrying on special work in it, by grants from scientific societies, the universities and such sources.

"The obstacle hitherto to the establishment of a British

Zoological Observatory has been the difficulty of obtaining the large sum necessary to launch the institution.

"It is calculated that £8000 would be sufficient to secure a site and erect and furnish a suitable building—whilst £500 a year should be secured as a minimum income for the purpose of paying a salary of £250 a year to a resident superintendent, minor salaries to fishermen and attendants, and of meeting the small current expenses.

"The income of the institution might be materially aided by the payment of a fee (say £5 a month) on the part of those naturalists making use of its resources.

"The opportunity for securing the £20,000 necessary for the inauguration of such a Zoological Observatory, has presented itself in connection with the International Fisheries Exhibition. Should there be, as there is reason to hope, a large surplus fund in the hands of the Committee of the Exhibition, at its close, it is proposed to bring the suggestion of the establishment of a Marine Zoological Observatory before the Committee, and to endeavour to obtain the support of that body for the scheme. It is proposed that a deputation of scientific men should interview the Committee of the Fisheries Exhibition, in order to explain the importance of a Marine Observatory and the close relationship of the work done in such an institution, to the interests of our Fisheries; and the Committee would then be asked to consider the propriety of handing over the sum of £20,000 (or if possible a larger sum, this being a minimum) to Trustees, for the purpose of building and endowing such an Observatory, provision being made as to the future government and occupation of the Observatory, as above suggested.

"The following gentlemen have expressed their approval of the general tendency of the above proposals, and their desire

to co-operate in any further proceedings directed towards the accomplishment of the plan of action here suggested.

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